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The Cunningham Coal Claims

Commissioner Dennett, of the General Land Office, with the affirmation of the Secretary of the Interior, has finally decided that the Cunningham claims were illegal. On the same grounds probably a large part of the coal lands of the United States, now being worked by companies and individuals, came into their possession through illegal entries in the first place. The Commissioner has decided that there was preliminary connivance among the Cunningham claimants, whose purpose was not to locate and work individual claims, but rather to develop a group of claims.

This has always been the practice, anyway during recent years, because a single coal claim of 160 acres cannot be economically worked. Consequently, any industrial concern that has acquired coal land, in order to obtain its own supply of fuel, a thoroughly legitimate purpose, or any group of persons that has sought to secure coal land for the development of a new country, as in the case of Alaska, also a thoroughly legitimate purpose, have been obliged to dodge the law, which law is admitted to be stupid by everyone except the luminaries of Congress, who have refused to alter it.

It seems that the Cunningham claimants failed to dodge the law quite far enough. The recent decision will probably be the end of the case insofar as they are concerned. We have previously scouted the ridiculous talk about the Guggenheims' gobbling of Alaska through these Cunningham claims, and have regarded the claimants as being rather ill-used individuals, who were refused a run for their money in what would be a risky venture, commercially considered, anyway. The administration is bound to execute the law as the law stands, and if the Cunningham claimants did not keep within the letter of the law, they cannot charge injustice, although they may obtain some sympathy. All of the talk about the "billions of treasure" in this coalfield was rank nonsense. It is strange that the facts in the Cunningham case could not have been established several years ago, without making so much ado about the matter.

If the spectacular features of this case lead Congress to enact a wise law instead of the present foolish one, neither Mr. Pinchot nor the Cunningham claimants will have lived in vain. The Cunningham claimants who have put real money into what they considered to be a not unpraiseworthy attempt to develop natural resources in a new country may have the sorrowful satisfaction of contributing to a necessary improvement in public policy. We say this with the idea that Congress will not forever be supine.

When Congress really gets busy enough to enact a sensible coal law we hope it will take the time to do a good job and revise all of the mineral laws. On the same kind of technicalities that poisoned the Cunningham claims we suppose that most mineral claims in the West would be invalid on the ground of absence of real discovery. This excuse for perjury ought to be eliminated. At the same time it would be well to abolish the law of the apex, upon which lawyers have fattened, if the shrewd legal "talent" and "honest" prospectors can be forced to forsake the "graft."

The Corner in Tin

The bull speculation in tin in London has apparently reached its climax and passed it, though the syndicate which carried it through is reported to be still in control of the market. This movement has been a remarkable one, and has been successfully consummated, probably with large profit to those who managed it.

Last August, when tin was selling at about £156 in London—that being considered a high price—it began to be rumored that the floating supply of the metal was being concentrated in a few hands. That is not altogether an unusual condition, and attracted little attention.

Prices continued between £156 and £160 for spot tin until October, when a steady advance began, which carried it up to £180 12s. 6d. at the opening of the year and to £195 at the end of January. At that time there was a small backwardation—that is, futures were selling a little below spot tin. The syndicate held prices about at that level, with an occasional small drop, until early in May, when the spot quotations began to go up rapidly. By May 17 spot tin reached £197 10s.; on June 1 it was £210, and the climax was reached on June 12, when £231 was paid; an advance of £75 over last August, and of £36 over January. The backwardation on June 12 was no less than £41, three months tin selling at £190. On June 14 spot tin was quoted at £229 and three months at £186 5s., a backwardation of £42 15s. Apparently the syndicate had attained its end, and the bars were let down, spot tin dropping in a week to £193 10s., while three months actually advanced to £191 12s. 6d., the backwardation or difference being only £1 17s. 6d. At what price the shorts were obliged to settle is not generally known, but their losses must have been heavy.

Such a movement is possible with tin as with no other prominent metal, because the quantity on the market at any time is comparatively small, and the margin between production and consumption is very close. The ownership of a moderate quantity is sufficient to control the market, and there are no large reserves anywhere which can be used to break a corner.

It may be of interest in this connection to review briefly the course of the market for some years. The advance in the metal in the past 15 years has been extraordinary. In 1896 and 1897 tin sold below 14c. in New York, the average for those years being 13.29 and 13.67c., respectively; while the London average for 1897 was £61 8s. From 1897 it rose rapidly, reaching averages of 29.90c. at New York and £133 11s. 6d. at London in 1900. For the next four years it dropped below that high point, but only a little, holding between 26.74 and 28.09c. at New York. In 1906 there was a marked rise, to a yearly average of 39.819c. at New York and £130 12s. 11d. at London. The next three years saw a drop of nearly 10c., to 29.725c., and £134 15s. 6d. in 1909. From time to time the markets were affected by speculation, but in the main the advance from 14 to 29 or 30c. was a legitimate one, based on a large increase in consumption, with only a small gain in production; and a failure to discover any important new sources of supply.

In 1910 the average price for the year rose to 34.123c. at New York, and this was partly due to the bull speculation, which dominated the market in the closing months of the year. The average New York price for the first five months of the current year was 41.665c., while for 18 days in June it was 45.333c.; the London averages for the same period being £190 7s. 3d. and £209 14s. 8d. These are the highest prices ever recorded.

What the immediate result of the movement may be is not altogether clear. The extreme speculation is apparently over, but the conditions still existing do not warrant an expectation of any considerable fall in prices, and the metal will probably remain at a pretty high level for some time. For many uses tin cannot be replaced; but there is a supply of what is known as "impure" tin, which usually sells at two or three cents below Straits, and this can be used for many purposes. The supply, however, is not very large. For one important use, roofing plates, it may be that a high price of tinplates will make an opportunity for the use of other metals—zinc, copper and Monel metal—in its place.

A Unique View of the Copper Situation

We fear that if Daniel Guggenheim persists in his practice of giving out an interview on the eve of his annual departure for Europe, he is in danger of becoming a confirmed humorist. In his remarks a few days ago he said that as to copper he feared a runaway market upward. He continued thus: "Nothing can be done to prevent a runaway price unless the various copper interests get together, study conditions and discuss their affairs. But this the copper people are not willing to do, because they fear the annoyance of persecution. It is quite true that they have had several dinners and discussed matters, but beyond this and being entertained by their charming hosts, nothing was accomplished."

Alas! these poor copper producers! Our hearts have been wrenched over the trials and tribulations that they have suffered from their own excessive production, and we have considered ways and means to ameliorate their sad situation, but it appears, according to Mr. Guggenheim, that all sympathy has been wasted, and that it is not the producers who have been courting trouble, but those wretched consumers, whose only safety against a quick recurrence of famine prices for copper rests in governmental permission to the producers to unite without fear of persecution, i.e., prosecution.

Mr. Guggenheim is well known as an advocate of governmental regulation of prices, he being in fact a species of socialist, although he might fail to recognize himself in that guise. He says that America is now the laughing stock of all European economists, because it is unwilling to allow its trusts a free hand, which, of course, means the ultimate regulation of prices by them. "In Germany," says Mr. Guggenheim, "everything is done to permit the stabilizing of prices." "Stabilizing" is a new and good word.

The natural law of supply and demand plays no part in the economic ideas of which Mr. Guggenheim is an exponent. It is only old fogies and closet-philosophers who still regard it as being of the order of laws of gravitation and the conservation of energy. As to governmental interference in corporate affairs, we commend to Mr. Guggenheim's attention the excellent sense of the recent decisions of the Interstate Commerce Commission, and the U. S. Supreme Court, and it would perhaps be helpful if he should have a heart-to-heart talk with Theodore N. Vail, whom doubtless he would recognize as a practical man and a captain of industry.

A statement made by Judge Gary to the investigating committee of Congress was to the effect that the Steel Corporation had acquired considerable interests in iron lands in Cuba, and was conducting explorations there. It does not appear that there is to be immediate development, but rather that these Cuban ores are to be held as a reserve. We do not think that it was generally known that the Steel Corporation had interests in Cuba; but it is quite in accordance with its general policy that it should acquire iron ore reserves in any quarter available.

Metallics

When magnesia and silica brick are used in the same furnace, a course of chrome brick should be placed between them.

The average cost of all machine drilling in the Ready Bullion mine for the year 1910 was $8.35 per shift for labor, $2.43 for explosives and $4.96 for power and supplies; a total of $15.74. The average cost per foot of hole was about 44c. and per ton of ground broken about 68½ cents.

H. Greenwood, in a paper before the Faraday Society, May 23, 1911, gives the boiling points of some metals as follows: Antimony, 1440 deg. C.; bismuth, 1420; copper, 2310; lead, 1525; magnesium, 1120; silver, 1955; tin, 2275; aluminum, 1800; chromium, 2200; iron, 2450; and manganese, 1900. These figures correspond to atmospheric pressure.

Lead is used in brass castings to render them free cutting, Without it, the metal would be too tough to cut freely. When the brass is free from lead and does not cut readily, it is called "hard." In good yellow brass composed of about 2 parts copper and 1 part zinc, the lead content should be about 3 per cent., not varying over 0.5 per cent. either way. Experience has demonstrated that this amount of lead is the most desirable.

The clarifying presses at the Oroya Brownhill cyanide plant are clothed with blue striped hessian or house-canvas, which is found to be more porous than ordinary filter cloth while it is less expensive and clarifies the solution equally well. After three weeks' use the cloths gather a thin film of sticky slime which is impervious but not sufficiently thick to scrape off; the cloths are, therefore, removed, sun dried, and beaten out, after which they are clean and porous enough to be used again. A set of cloths lasts six months.

The concentrate from the Waihi Grand Junction mill was treated by regrinding in a tube mill, agitation by air in Pachuca tanks, and filter pressing. The cost of regrinding to a sufficient degree of fineness was high. Some idea of the cost may be gathered from the fact that it required one tube mill, 19 ft. 3 in. by 4 ft. 8 in., to grind 10 tons of concentrate per 24 hours. The wear on liners was also excessive, and the flint consumption amounted to 3000 lb. per week. It was decided to add coarse sand to the concentrate as it entered the tube mill, it being considered that this would help the grinding of concentrate. The result was most encouraging, and led to concentrate being fed into the other mills used for grinding ore, which meant the abandonment of the concentrate-treatment plant, the whole of the ore being treated as sand and slime.

By the Way

The tenor of the press despatches from London last week led the *Evening Post* to remark that they conveyed the impression that George V was giving a coronation in honor of John Hays Hammond.

A recent standard metallurgical work shows a copper furnace casting anodes, ingots, and wire bars, all on the same Walker wheel. Think of handling that mixed product. Where is the "motion studier?"

It is reported that two of our technical schools give courses on "works management," one 10 hours and the other 30 hours long. These must be taught on a scientific-management basis to cover this ground in such short order.

A shooting bee has taken place in Tonopah over a claim in that district. According to the Carson *Appeal,* this is a most favorable sign, as a claim must be good to be worth shooting over, and a new Tonopah boom may be looked for.

The copper producers appear to be publicly concerned over what will happen to the copper consumers in an about-to-be runaway copper market. Which way will it run? This reminds us of the general who telegraphed "We have the enemy on the run." An hour later—"We are still ahead."

An engineer who had occasion to correct the discipline of the boys composing the crew at the picking table in one of the plants in the South, instructed his crusher foreman to post a notice in the crusher house regarding the matter. The result of the crusher foreman's literary effort is given below:

NOTICE TO YOU BOYS

thire Has Ben Severl Window lights Broken out and Lamps Globs and you boys No Something A Bout hit You haint in here for that Kind of Work and if I find one of you throughing A Round I am going to send you in I Like to see Boys Be Smart But not to Smart So you all Can take notice and Do what you are Told and Stay at the Pickling Table are you will Be going Home I Haint going to put up With Such Stuff.

Yors,
B. MORGAN.

The first artesian well in the United States was drilled by David and Joseph Ruffner at Salt or Buffalo Lick, near Charleston, W. Va., in the Great Kanawha valley in the year 1806. The well was drilled into salt sand from which an ample supply of brine began to flow, Jan. 15, 1808. The brine was used for the manufacture of salt. The chisel bit, 2½ in. in diameter, was made of steel and attached by a rope to a spring pole mounted in a forked stick. The casing consisted of two long strips of wood whittled into half tubes and wrapped with twine. According to R. B. Woodworth this was the beginning of the cable system of deep-well drilling that is now used in nearly every oilfield.

One restraint upon the Porcupine boom which London, Toronto, Montreal, and the New York curb market are so earnestly wishing for, says the *Evening Post* is the cost of getting let in. A lot of money has been made at Porcupine, though not in mining. The first owners of claims have made it without labor. They have traded on the fabulous notion that all the gold that has ever been found elsewhere in the world strayed from Porcupine, which is the source of all gold; the great, original outcrop. Except for the disinclination necessary to be overcome to perform productive labor, they would not sell their claims at all, at any price.

Surveyors should note a lawyer's opinion of certain landmarks. In 1847 Mr. Choate was the lawyer for parties whose rights were affected by the boundary lines between Massachusetts and Rhode Island, which was described thus in the agreement: "Beginning," etc., "thence to an angle on the easterly side of Watuppa pond, thence across said pond to the two rocks on the westerly side of said pond and near thereto, thence westerly to the buttonwood tree in the village of Fall River," says *Engineering-Contracting.* In his argument, commenting on the boundary, Mr. Choate referred as follows to the above part of the description: "A boundary line between two sovereign States described by a couple of stones near a pond and a buttonwood sapling in a village! The commissioners might as well have defined it as starting from a blue jay, thence to a swarm of bees in hiving time, and thence to 500 foxes with firebrands tied to their tails."

Faith has been scoffingly defined as the capacity to believe in that which one knows to be untrue; but we are inclined to think that there is a good deal more artfulness than faith in an old "superstition," for which nearly a score of young Staffordshire men were recently fined, says the *British Clayworker.* The men, who were employed as drivers at a colliery connected with a fireclay works, complained of the wet condition of the mine, and refused to go down. Eventually they decided to abide by the result of throwing a brick into the air; if the brick came down again, they would not work; if it remained, like Mahomet's coffin, suspended somewhere between heaven and earth, they would resume their duties. Needless to say, the brick obeyed the law of gravity and duly came down, whereupon the men disobeyed the law of the land and unduly stayed up. As their refusal to go down the pit caused considerable danger, an unsympathetic but wise judge fined the holders of this convenient superstition 15s. each.

Union Iron Works Acquires Risdon Dredge Department

The Union Iron Works, of San Francisco, has purchased the dredge-building equipment, patents and good will of the Risdon Iron Works, and will organize a dredge-building department. The mining-machinery department will be under the supervision of R. H. Postelwaite, and George L. Hurst, formerly engineer in the dredge department of the Risdon company, will be in charge of dredge construction for the Union works. President Augustus Taylor, of the Risdon, denies positively that his company will engage in the iron and steel business in any shape and states that as soon as the affairs of the corporation are wound up all of the members will retire from business. The recent sale of the Risdon properties, in the Potrero district of San Francisco, to the American Steel and Wire Company, and the sale of the dredge business to the Union Iron Works marks the passing of one of the oldest firms from the iron and steel industry of the Pacific Coast.

Powder Trust to Be Dissolved

On June 21, Judges Gary, Buffington and Lanning filed an opinion in the United States Circuit Court at Wilmington, Del., declaring the E. I. du Pont de Nemours Powder Company and 27 affiliated companies and individuals to be guilty of "maintaining a combination in restraint of interstate commerce in powder and other explosives." The court will hear arguments on Oct. 16 as "to the nature of the injunction which shall be granted herein, and as to any plan for dissolving said combination." It is stated that the du Pont Company controls 64 per cent. of the black blasting-powder trade in the United States; 72 per cent. in saltpeter blasting powder; 72 per cent. in dynamite; 73 per cent. in black sporting power; 64 per cent. in smokeless sporting powder; and 100 per cent. in smokeless military and ordnance powder, exclusive of what the United States Government itself makes. The 28 defendants declared to be in illegal combination are: The Hazard Powder Company, Laflin & Rand Powder Company, Eastern Dynamite Company, Fairmont Powder Company, International Smokeless Powder and Chemical Company, Judson Dynamite and Powder Company, Delaware Securities Company, Delaware Investment Company, California Investment Company, E. I. du Pont de Nemours & Co. of Pennsylvania, du Pont International Powder Company, E. I. du Pont de Nemours Powder Company of New Jersey, the E. I. du Pont de Nemours Powder Company of Delaware, E. I. du Pont de Nemours & Co., Thomas Coleman du Pont, Pierre S. du Pont, Alexis I. du Pont, Alfred I. du Pont, Eugene du Pont, Eugene E. du Pont, Harry F. du Pont, Irenée du Pont, Francis I. du Pont, Victor du Pont, Jr., Jonathan A. Haskell, Arthur J. Moxham, Hamilton M. Barksdale, Edmond G. Buckner and Frank L. Connable.

Lake Superior Mining Institute

A circular from the Secretary's office, under date of June 22, says that the local committee on the Menominee range has selected Aug. 22, 23 and 24 as the dates for holding the sixteenth annual meeting, and the council has voted in favor of same. Arrangements are now under way for the entertainment of the members and further circulars will be issued containing the itinerary of the trip together with papers to be read, also any excursion features which may be decided upon.

Members are invited to prepare papers for presentation at this meeting and in order that the same may be printed in advance they should be sent to the secretary as soon as possible so as to permit sufficient time for printing and mailing. At the meeting held last year a committee was appointed to prepare papers on mining methods on the Menominee range. This committee will present some interesting papers and it is desired to also receive papers on mining methods on the other ranges.

"Efficiency," which is receiving a great deal of attention by large industrial concerns, offers a subject for consideration by the Institute. The question of "Uniform Mining Laws," which has been taken up by some of the other societies, also offers interesting points for discussion; members are especially requested to prepare papers on these as well as other subjects pertaining directly to mining. Attention is also called to the question of "Safety Appliances" and general improvements for the safety and benefit of employees.

Beck Tunnel

SALT LAKE CORRESPONDENCE

The annual report of the Beck Tunnel company, operating in the Tintic district, Utah, issued at the meeting June 6, has been sent to stockholders. This showed that the mine was closed and remained idle from June last to February, 1911, when the tunnel was driven westward toward the Uncle Sam property for ore which was known to be near the Beck Tunnel boundary. Ore was encountered and connections made with the Uncle Sam workings. A winze sunk on ore has produced all of the shipments from the tunnel, and these shipments have paid the expenses of development. Another face is in ore, which promises further shipments. Prior to making connections with the Uncle Sam, a survey was made, showing that some ore has been extracted from Beck Tunnel territory, but the matter was compromised and the suit commenced by the company dismissed. A vertical boundary agreement was made. Some work has been done on the 175-ft. level of the No. 1 workings, and ore encountered. There were shipped 516 dry tons of ore, having a value of $6341 in gold, silver and lead.

During the year the liabilities were reduced $33,642, through assessments, sales of old equipment and ore shipments. The assessments brought $49,581, making the total receipts $57,517. There was an overdraft June 1, 1910, of $19,892, and there are liabilities in notes payable of $37,900. During the year 988 ft. of development was accomplished. Conditions are favorable for developing new orebodies. Sand carbonates are reported in the new cave recently encountered and a winze has been sunk from the cave 15 ft. on ore.

Miners' Phthisis in South Africa

A commission composed of five physicians has just been appointed to conduct a medical examination of Transvaal miners, in order to ascertain approximately the liabilities which would be incurred under the provisions of the proposed miners' phthisis compensation act, which will be introduced in the House next year. The withdrawal of the bill on April 21 caused such a wave of indignation among the members of the Transvaal Federation of Trade Unions that they passed the following resolution: "That we, the Federation of Trade Unions in the Transvaal, view with disgust the disgraceful surrender of the government to the Chamber of Mines and the broken pledges of the government in the matter of the phthisis bill, etc." Another point to which the miners object is the compulsory medical examination under a penalty of £50 or imprisonment.

The government has voted £25,000 toward relieving those suffering from miners' phthisis, and the minister of mines hopes that the mines will contribute an equal amount for the same purpose until such time as the medical commission has finished its labors. The mine owners are anxious to decrease the alarming prevalence of the disease, and are doing much to put the mines in a better and healthier condition by encouraging the miners to develop soundness of physique, to live under the best of hygienic conditions in providing good houses and rooms for them, and by the adoption of any and every device, or method, or machine, that has a tendency to eliminate dust from the mines.

The Rand Mines group has spent since 1902 nearly $5,000,000 in improvements, extensions, etc., for its employees. Of this amount $2,000,000 have been spent for improved housing and hospital facilities for natives.

Correspondence and Discussion

Sampling Ores from Cobalt Mines

Referring to A. A. Nason's comment on my method of ore sampling described in the JOURNAL of April 15, I should like to state that the ore is not thrown from one ridge to the other nor is it carried carefully; neither one of these processes being necessary. In my article it was clearly stated that the ridges were about three feet apart. So it will be seen that a man standing between the two, taking up a shovelful from one and swinging partly around, without taking any steps at all brings his shovel directly over the apex of the ridge on which it is to be deposited and by one simple movement the shovelful can be scattered for several feet along the top of the ridge.

The cost of sampling by this method is not "tremendous" as stated by Mr. Nason, although it is a little higher than by automatic sampling. Yet the slight increase in cost is not to be taken into consideration when the securing of accurate results is at stake on ore often carrying 3000 to 4000 oz. of silver per ton.

Mr. Nason also speaks of automatic sampling as being the proper method. In automatic sampling it is customary to cut out one-fourth for the sample with a three-fourths discard, this being repeated until the lot to be sampled is cut down to 1000 or 2000 lb. This is usually quartered or cut on a Jones divider into four parts which are considered four samples. They are not, they are simply equivalent to one sample with four assays. These four assays will invariably check closely, and the work is considered good, when in fact it may not be near the true value of the ore. Sometimes it will be high and again low. In one case recently where a car load of high-grade ore was ground in a ball mill to 40 mesh, sampled automatically, then put on the floor and sampled by the ridge method, the automatic sample ran about 40 oz. higher than the floor sample. The material being resampled on the floor checked the original sample.

I have a large amount of data in connection with the one-sample method and the floor sampling, and in nearly every case the one-sample method ran above the floor sample or else dropped much below and in some cases it dropped about 100 oz. per ton below, while in nearly every case of a resample on the floor it checked the original sample within two or three ounces per ton.

After having had the task of sampling 270 carloads of all grades of Cobalt ores, I am satisfied that automatic sampling will work well on low-grade ores free from metallic silver, but on high-grade ores carrying large quantities of metallic silver it is not the proper method, and that the floor method gives much more accurate results. I should also like to state that the method as described in the JOURNAL of April 15 is neither antiquated nor fossilized. F. W. PUGSLEY.

Perth Amboy, N. J., June 14, 1911.

Views, Suggestions and Experiences of Readers

Water Supply for Mines

In the various discussions of matters pertaining to safety in mines that have frequently appeared in the JOURNAL the necessity or advantage of a water supply has received barely more than passing comment. In the metal mines of the United States it is rare that a separate system of piping is provided to supply water to stopes and advancing drifts. Often the system is inadequate in that water must be carried in buckets for long distances to the faces where it is needed.

In dry mines it is or should be particularly imperative to provide the mines with a plentiful and nearby supply of water for use in allaying dust. The danger of dust to the health of miners in dry, dusty mines is seldom realized and then rarely to any effect. It is costly to install water service and the benefits are too little apparent to the eyes of the management, in most instances, to justify such expense.

By providing a plentiful supply of water where drilling is going on the unpleasant and unhygienic effects of dry dust cannot be entirely eliminated but can be materially reduced by sprinkling the walls and faces.

Of course, the advantages of a water service system are most apparent in times of fire, especially in those mines in which much timber is used in the stopes. A supply of water to the stopes would often mean the averting of a serious fire. At some mines the air lines are so connected with storage tanks situated at various levels that the lines can be supplied with a large supply of water under a pressure not too great to rupture the pipes. When needed, water can be supplied through the air pipes to any part of the mine to which those pipes extend, by stopping the compressor and opening the valves leading to the tanks. Such a system is excellent in times of fire but there is considerable delay in making the necessary connections and such a water supply, of course, can not be used to spray walls with the object in view of mitigating the dust evil.

One further advantage of a water supply in dry mines, especially where much timber is used, is that it makes it possible to systematically sprinkle the timbers, thereby prolonging their life.

MINE FOREMAN.

Deadwood, S. D., June 10, 1911.

Spraying to Allay Dust

The allaying of dust and fumes from blasting in mines is now receiving much attention, as their effects on the health of the miners are being more fully appreciated. In the metal mines of South Africa and Australia, more attention has lately been paid to such matters than seems to be the case in the United States, and the mines regulations acts are now being extended to compel the use of dust-allaying equipment.

At the Mount Morgan mine in Queensland, sprays and combination jets of air and water are used to allay dust and dispel fumes after blasting; much sulphurous fume is given off when the sulphide ore is being blasted. The mine is equipped with water pipes on all the main levels, so that the installation of sprays in drifts and stopes can be made without difficulty.

For advancing drifts, water pipes are laid to near the face, then run up to the roof with a short piece of pipe leading out to the center of the roof, ending in a right-angle bend to the end of which a spray nozzle is attached. The pipe is situated far enough from the face so that the spray covers the entire face of the drift.

At the chutes, on the main haulage levels, leading to the main-shaft ore pockets, sprays are installed at the center of the collar and high enough above it to reach the dust arising when cars are dumped. When a train is ready to be dumped, the spray is turned on and little dust clouds the drift.

The Mount Morgan company has appointed an extensive staff to investigate the dust and other problems bearing on the health of miners, and from the reports of the investigations that the staff has elaborately carried out, stringent regulations will be enforced.

The use of sprays will be stipulated as an essential in making contracts for drifting; shovelers will be compelled to sprinkle ore and waste whenever it is dry enough to give rise to dust while being shoveled; and the use of sprays in

stopes, raises and all other underground excavation work will be compulsory.

The Mount Morgan mine has always been regarded as exceptionally well ventilated, but the recent investigations by the company's special staff and the various reports on the physical examination of miners carried on by the government, seems to have convinced the enlightened management that much remains to be done to ameliorate conditions under which the miners work.

JOHN THUM.

Rockhampton, Queensland, Australia, May 4, 1911.

Tracing the Outcrop of a Vein

The article on topographic mine mapping by J. H. Farrell in the JOURNAL of March 25 and that on geology applied to mining by Linforth and Milburn in the JOURNAL of April 1, recall some work that I did several years ago in one of the Central America republics, the results of which were, I believe, of sufficient interest and value to describe in detail.

As often is the case in those countries a large mineral concession had been granted by the government to certain individuals who enjoyed the favor of the powers that be. The concessionaires, being men of moderate means, could not develop their property, so sought in Europe the financial assistance of a company of extensive resources. A number of outcrops of ore were known on this property, and some erratic work such as trenching and tunneling had been done but in such a manner as to be of little use to the examining engineer. Many years before a company had worked a mine to a depth of 700 ft., and records were extant of a large profit made from the operations. That old mine had caved at the surface and was inaccessible, so little first-hand information was obtainable from that source.

TOPOGRAPHY AND GEOLOGY

The country was rugged and mountainous, in general resembling the San Juan district of Colorado but not so precipitous. The geological section showed quartzose schist as the lowest member exposed, above which were beds of sandstone, marl and hard blue limestone; all these sedimentaries dipped westward at a low angle. Over the sedimentary beds and projecting into them in the form of tongues was a series of igneous flows of felsitic nature. The limestone beds were at least a thousand feet thick and the flows probably greatly exceeded that thickness. Throughout the district both sedimentaries and flows were intersected by numerous dikes of basic igneous rock of undoubtedly later formation.

The entire country had been deeply eroded. The mountain ridges were separated by deep gulches through which streams flowed, and into these gulches shallower ravines entered which cut the slope of the mountains almost at right angles to the axes of the ridges. These ravines were nearly parallel, and at no great distance apart. Between them the slopes of the mountains were well rounded, covered with thick soil and open forest growth.

Most of the known outcrops were found a short distance from the ravines or high up the hills in precipitous bluffs. The beds of the ravines were filled with boulders, many of which were solid ore, but only two outcrops were found in going up the ravines The outcrops were far apart and were known over a distance of two miles. Samples showed the ore to be rich in zinc, lead and copper with a fair amount of silver. Some of the outcrops were of entirely oxidized minerals while others were unchanged sulphides. Sampling the outcrops proved them to be of a grade that even in that remote country would have been highly profitable to work.

DETERMINING THE POSITION OF THE VEIN

The first question to be decided, in this instance, was whether the surface indications would justify a large expenditure of money to thoroughly prospect the deposits. The outcrops were too far apart to be considered as showing continuity of the veins in length at the surface and it was decided to trace the veins laterally before beginning any work to explore them in depth. Although many ravines cut deeply across the apparent strike of the veins, but two outcrops were known in their beds, which gave rise to the expectation of finding that the ore did not occur as a continuous vein but as a series of lenses, the outcrops of which were known and that the reason so little ore had been found in the ravines was that the lenses failed before reaching them except in the two instances mentioned.

The first work consisted in making a topographic map of the country along the line of the outcrops. This work was done with transit and stadia or by compass and tape, the contours being approximately determined by a hand level. Meanwhile men were put to work cutting short inclines or tunnels into the outcrops closely following the hanging wall. The purpose of this work was not to explore the deposits in depth but to determine whether the outline of the contact of ore and hanging wall indicated a lense or a vein, and if the latter, the approximate dip.

By the time the topographic maps were completed the tunneling work had shown, sufficiently for the purpose, that the ore cut was in a vein of nearly uniform thickness with little gradual increase and decrease of thickness that would have resulted were we cutting along the top of a lense of ore.

Two of the long outcrops were stripped on the surface for a distance great enough to determine the strike of the deposits with fair accuracy. The strikes, as determined for these outcrops were practically the same. The line of strike was then drawn on the map extending between the two most remote outcrops. The veins were found to be dipping downward into the mountain toward its axis and using the dip determined in the tunnel work, the lengths of the offsets at right angles to the strike were determined and whether the offset should be to the east or west to reach the point of outcrop at the various elevations and distances from the plotted line of strike.

THE RESULTS OF TRENCHING

Upon determining the points on the map where the vein, if continuous, should outcrop, that place was sought in the field and trenching work started. This vein hunting was exciting. The first points of attack were along the banks of the ravines where it was found that the ore had been considerably leached from the vein and that it had been hidden beneath a mantle of soil. In every ravine the crossing of the vein was found and in the knolls between, trenches, almost without a single exception, revealed ore lying a few feet below the surface.

The outcrops had led us to suppose that there was a series of parallel veins but this surface work showed conclusively that there was but one. Some of the outcrops, the position of which could not at first be accounted for, were found to be faulted blocks. On one of the claims where much ore had been found at the surface, it was proved that no ore existed, but that the entire slope of the hill was covered with immense boulders of rock and ore that had rolled down from the hill above where the outcrop had receded by erosion until probably some 500 ft. of the upper part of the vein had been removed. So large were some of these boulders that they had been mistaken for ore in place. One tunnel in a boulder was 65 ft. long and through another a shaft had been sunk apparently in solid ore to a depth of 50 feet.

The result of the work was that it was shown that there was a vein of ore nearly two miles long dipping into the mountains at a low angle and that exploration could be most rapidly and cheaply done to a depth of 500 ft. on the dip of the vein by means of core drills. This is a story without a sequel, for prolonged political disturbances caused cessation of work and, so far as I know, it has never been resumed.

THOMAS F. KEETY.

New York, N. Y., June 27, 1911.

Details of Practical Mining

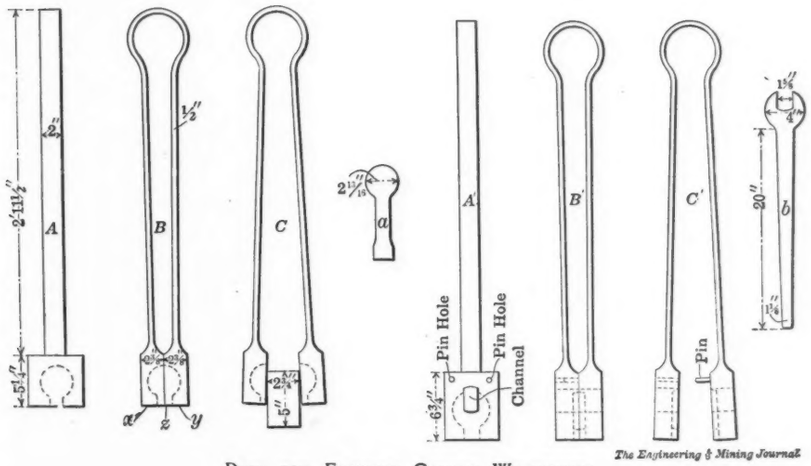
This department is designed to treat in a brief way of details of everyday practice. Many readers are doing interesting things in mining and milling that other readers like to know about. The thought that there is nothing new in them should not be a deterrent of telling about them. Something that is an old story in one district may be quite unknown in another. Our draftsmen can develop any kind of pencil sketch that is intelligible. A blueprint answers all the purposes of the engraver. Contributions are solicited.

Notes of Interest to Prospectors and Operators of Small as well as Large Mines Things that have to be done in Everyday Mining

Making Chuck Wrenches

BY F. L. FISHER*

In the larger mines at Butte where a great number of air drills are in constant use, chuck wrenches, used in manipulating the chuck-bolt nuts for holding the drill in position in the head or chuck, have to be supplied in large numbers, on account of breakage and loss. In order to meet the demand for wrenches at the least possible cost of time and labor the simple apparatus herein described has been constructed and is being used at some of the mines.



DIES FOR FORGING CHUCK WRENCHES

An iron mold is made as shown in the sketch, in front view at *A*, and in side views at *B* and *C*. It consists of two blocks of iron *x y*, connected by a thin steel handle having a loop at the end serving as a spring similar to a pair of tongs. A sphere is hollowed out of the metal, half of it in each block, and which is connected to the end of the mold by *z*, a smaller opening.

A piece of soft bar-steel is heated to white heat and inserted between the jaws of the mold while drawn apart by the operator as shown in sketch *C*. The jaws are then forced together with the steam-hammer, causing the end of the heated piece of metal to take the shape of the mold, forcing the superfluous iron out through the orifice in the end, giving it the appearance shown in sketch *a*. The part is then removed from the mold and the ball at the end partially flattened on opposite sides in a plane parallel with the shank, by the use of the steam-hammer or sledge.

The bar is then thrust into a second mold shown in sketch, in front view at *A'* and in side views at *B'* and *C'*. The form of the interior of this mold is of the shape and size of the finished head of the wrench, and as in the other mold, half is cut in each jaw, with an opening through the end of the mold. Through both jaws of the mold a channel is cut, passing through the chamber as shown at *A'*. A hardened steel plug 3 or 4 in. in length, and of a size to exactly fit and pass through this channel, is then made.

The head of the wrench is now compressed in this mold in the same manner as in the first mold, and two pins in one jaw, fitting into corresponding sockets in the other, prevent any spreading of the jaws during compression. The cold-steel plug is now driven through the channel, forcing through with it the part desired to be cut from the end of the wrench to fit the nut. The head of the wrench now being completed, it is taken from the mold, and as the whole operation has required not over two minutes, the same heat is all that is necessary to draw the shank out into the handle of the finished wrench by the common method with the steam-hammer or sledge.

*Mining engineer, Butte, Mont.

A Qualitative Test for the Platinum Metals

A simple and interesting method of testing qualitatively for metals of the platinum group has lately been worked out by L. J. Curtman and P. Rothenburg[1], based on the catalytic action of these metals on mixtures of hydrogen and oxygen. Pieces of asbestos paper 0.03x0.5x 3.0 cm. were used to absorb the solution to be tested, about half the paper being wet and then dried gently in the Bunsen burner, then rewet and dried until about 0.2 cc. of the solution had been absorbed. The paper was then heated to redness in the Bunsen flame and removed. After redness ceased but while the paper was still hot it was placed in a stream of mixed illuminating gas and air from a Bunsen burner. If the paper began to glow platinum, palladium, iridium or rhodium was present. The mixture of gases must be good and the pressure not too great.

It was found by experiment that the glow ceased to be apparent when the amount of platinum fell below 0.002 mg. in 0.1 cc. of solution tested. With palladium the effect ceased to be noticeable when the amount fell below 0.0049 mg. in 0.1 cc. of solution tested. With iridium 0.005 mg. in 0.1 cc. of solution, and with rhodium 0.0009 mg. in 0.1 cc. of solution marked the limit of visibilty. Osmium and ruthenium give no glow reactions, probably owing to the volatility of the oxides of these metals. The glow may be revived several times by reheating the asbestos paper in the Bunsen flame and again placing it in the gas and air stream.

In general it may be said that all substances which, after ignition, leave a heavy residue on the asbestos paper, impair the sensitiveness of the test inasmuch as quantities of platinum near the lower limit will not glow. Solutions strong in nitric acid attack the asbestos paper, causing it to swell up, and thus decrease the sensitiveness of the test. Relatively large amounts of the alkalis interfere, and experiments with Na_2SiO_3, Na_2CO_3, NaOH,

[1]*Journ.* Amer. Chem. Soc., May, 1911.

$Na_2B_4O_7$, Na_2SO_4, NaCl, $KNaC_4H_4O_6$, NaF, KCl and LiCl showed that if the alkalis exceeded 800 times the platinum present no glow could be produced. [Fortunately H_2S affords a ready method of concentrating the platinum metals and eliminating alkalis.—EDITOR.] Gold interferes if present in a proportion of over 500:1 of Pt, but preliminary precipitation of the gold by oxalic acid allows an original content of 2500:1 to be dealt with successfully.

APPLICABILITY OF THE PROCESS

In the generality of practical work, the glow reaction is distinctly a qualitative test for platinum, as this is the most common metal of the group. The test has been applied to samples of black sand, platinum residues, sweeps, etc., and in every case a good test was obtained without any preliminary separation.

Patching Vanner Belts

BY CLAUDE T. RICE

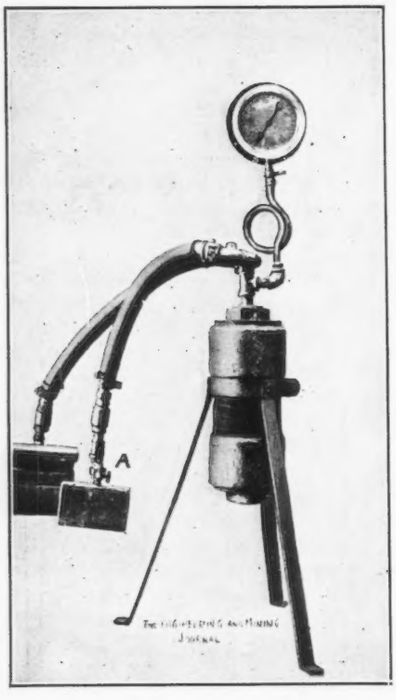
No matter of how good rubber a vanner belt is made, in time it will deteriorate and the lip on the side will begin to crack from the constant stretching that it receives as it passes around the rollers. If not attended to, this break finally extends into the bottom of the belt and trouble ensues because of the leakage on to the frame and running gear as well as from the slop that follows. The belt is generally patched by cementing or sewing in an old piece of belt. But the sewed patch results in leaks, while it is hard to make a good patch by cementing.

On that account the Tonopah Mining Company has been patching the old belts at its plant at Millers, Nev., by inserting pieces of old belt and vulcanizing the damaged part of the belt; thus making the injured portion as good as new.

In doing this patching, the damaged portion of the belt is cut away and a piece of old vanner belt, shaped exactly to fit the hole, is inserted. A layer of crude rubber, 1/16 in. thick, and large enough to extend an inch around the patch on both sides of the belt, is next put on as a cover. The forms, shown in the accompanying sketch and photograph, are then clamped over the patch so as to cover the portion of the belt to which the patch is to be bound as well as the patch itself. In the case of a large patch, the vulcanizing is done in steps starting at one edge so as to tie the patch securely to a strong part of the belt, and the vulcanizing is extended until finally the other side of the patch is bound securely to the belt.

The forms, which are made of brass, are hollow to allow the passing of steam through them so as to vulcanize the rubber. In order to promote the circulation of steam at the beginning of operations, there is a pet cock on each form. One of the forms has a recess hollowed in it so as to conform to the contour of the raised edge, while the other, which is pressed by clamps against the bottom of the belt, is flat.

After the forms have been clamped in place, the pipes leading to the two forms are attached to the two hoses coming from the vulcanizing apparatus, which is nothing but a minature boiler with a pressure gage attached. The water in the vulcanizer is then heated by means of a torch to a pressure of 60 lb. per sq.in., and the pressure is held at that point for 45 min. while the crude rubber is being cooked. The vulcanizer is then disconnected and the vulcanized surface of the patch allowed to cool slowly with the forms still clamped in place. When the belt has become thoroughly cold, the forms are removed, and the belt with a



VANNER-BELT VULCANIZER

new coating of rubber over the worn place is ready for use.

The patching is done with the belt on the concentrator, as the vulcanizing apparatus can easily be carried from place to place. Even when a man has to stay near to watch the work during the cooking process, the patching is not expensive, while if an electrical coil were used to heat the vulcanizer, this watching could be done away with. The patch has a smooth surface, and is on to stay. The belt can be made to last much longer in this way and the efficiency of the milling is increased by keeping the broken-in belts longer at work, as it is well known among millmen that an old belt generally makes a better saving than does a new one during the time that it is going through the breaking-in stage.

Determination of Smeltery Flue Leakage

BY GEORGE C. WESTBY AND O. E. JAGER*

Investigations in smeltery or furnace economics often call for the measurement of flue or chimney discharges, and the estimation of the leakage through the masonry of the smoke channels. A calculation for deducing the leakage from the smoke analysis is here given. As it is generally more convenient to calculate the discharge from analysis of the gases and vapors constituting the smoke, this method of deriving the smoke volume is used.

As a basis for the computation it is necessary to know the weight of one of the volatilized constituents of the ore or fuel, whose products of combustion form the gases or smoke under consideration. The choice of the constituent would depend on the data available and on the kind of plant to be tested. At a smelting plant the sulphur in a pyritous ore would be the most convenient factor on which to base the estimation, while the carbon in coal might be adopted as the foundation of the computation at a power plant.

Take as an example the case of a furnace roasting pyritous ore, where 11.5 lb. of sulphur are burned off per min. and the flue gas analyzes 4.5 per cent. SO_2. Since 11.5 lb. S gives 23 lb. SO_2, and 1 cu.ft. SO_2 weighs 0.1709 lb. at 0 deg. C. and 760 mm. of mercury the number of cubic feet of SO_2 per min. at 0 deg. C. and 760 mm. would be 134.5, and since 134.5 cu.ft. SO_2 is 4.5 per cent. of the total volume of dry smoke, then there are 2985.9 cu.ft. of dry smoke at standard pressure and temperature. Assuming the observed temperature and pressure to be 280 deg. C. and 630 mm. mercury, respectively, then $2985.9 \times \frac{760}{630} \times \frac{553}{273} = 7296.4$ cu.ft. dry smoke at observed conditions. To this volume must be added that of the water vapor arising from the moisture of the ore.

Assuming that the furnace treats 35 tons of ore per day, carrying 5 per cent. moisture, there are 2.43 lb. of water driven off per min. into the flue. This is 63.9 cu.ft. at 100 deg. C. and 760 mm., and at the pressure and temperature observed the volume is 113.8 cu.ft. which, added to the volume of dry smoke gives a total discharge of 7410.2 cu.ft. per min., at the observed temperature and pressure.

After the derivation of the volume passing through the smoke conduit at any particular point, the determination of leakage between any points along the flues can be made by running simultaneous analyses for SO_2 at the points between which the measurement of leakage is required. The computation is then as follows:

*Selma, Ore.

Let a = number of parts of SO_2 at first point; b = number of parts of SO_2 at second point; and x = volume of leakage. Then, $\frac{a}{1+x}$ = number of parts SO_2 per volume at second point, or $\frac{a}{1+x} = b$; $x = \frac{a-b}{b}$ and $100\,x$ = per cent. of leakage.

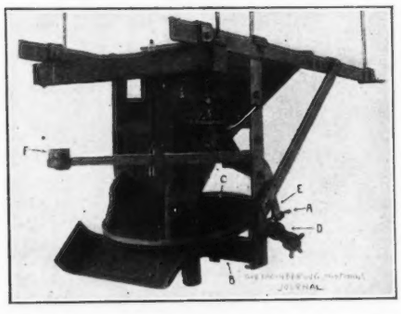
To apply this to the assumed case and neglecting consideration of correction for temperature differences, although in general the temperature correction must be made: If there is 4.5 per cent. SO_2 at point *A*, and 3.5 per cent SO_2 at point *B*, by substituting in the formula we have $x = \frac{4.5-3.5}{3.5} = 0.285$, or leakage = 28.5 per cent. If the discharge at point *A* is 7410.2 cu.ft., 28.5 per cent. of this is 2111.9 cu.ft., representing the leakage of air between the two points.

An Improved Feeder Drive

By J. W. Swaren*

An improved method of driving Challenge feeders is in use at the mill of the Trinity Gold Mining and Reduction Company in Trinity county, California. The drive is the invention of C. T. Hutchinson and is shown in the accompanying illustration.

A wire rope *A* fits into a groove *B* turned in the feeder plate *C*, one end of which is attached to a coil spring *D* of the compression type, rigidly fastened



The Hutchinson Challenge Feeder

to the feeder frame. The other end of the cable is attached to a lever *E* as shown in the illustration. The end *F* of the lever is engaged by a collar on the stamp stem so that the falling of the stamp tightens the cable, causing a partial rotation of the feeder plate. When the stamp rises, the spring returns the lever, but the cable, not being under tension, slips in its groove.

The amount of movement of the operating lever is governed by a stop which can be adjusted within certain limits. The drive has been patented and will be marketed by the Joshua Hendy Iron Works, of San Francisco.

*Shawmut building, San Francisco, Cal.

The Boston Consolidated Classifier

The character of the work accomplished by the modification of the Anaconda type of classifier, used at the Boston Consolidated mill, and which was described in detail in the Journal of Nov. 16, 1910, is shown by an accompanying screen analysis of the spigot products.

SCREEN ANALYSIS OF SPIGOT PRODUCTS

Mesh	Relative Weights of Spigot Products		
	First Spigot	Second Spigot	Third Spigot
On 50	42	2	0
On 80	38	28	6
On 100	8	12	8
On 150	6	20	22
On 200	2	8	10
Through 200	4	30	54

The feed to each classifier came from six Nissen stamps crushing through a diagonal-slot punched screen, equivalent to a 26-mesh, No. 26 wire screen, at a dilution of about 7.22 parts of water to one of dry ore. The ore crushed by the stamps varied greatly, and averaged one month slightly more than nine tons per 24 hours per stamp. At that rate of feed, the classifiers were not crowded and worked quite satisfactorily, so that a classifier with the dimensions given in the article referred to is able to handle at least 18.5 tons of pulp per hour without crowding.

A Method of Lighting Fuse

Where blasting gelatin is used at a mine, E. M. Weston[1] suggests cutting two notches in the fuse, one about half an inch from the end and the other a quarter of an inch above it, both notches being inclined toward the igniting end of the fuse at an angle of 45 deg. and passing just through the core. A thin strip of gelatin 1½ in. long is then cut from an opened stick and one end placed deep in the first notch; the other end being carried once around the fuse and inserted in the other notch. Both notches are then pressed together.

The fumes generated by so small a quantity of blasting gelatin are inconsequential and ignition of the fuse is much more certain than is the case when the end of the fuse is merely split open for an inch of the length. This practice is similar to that common in the United States where, when dynamite is used, a little of the powder is inserted in the split end of the fuse. In the case of dynamite, this priming is apt to drop out which is impossible with gelatin used in the manner described and moreover, where two notches are cut there is less chance of the priming failing to ignite the fuse.

[1]*Journal* of the Chemical, Metallurgical and Mining Society of South Africa, October, 1910.

Improvised Smoke Helmets

In building a dust chamber and stack for the converters at the Cananea Consolidated Copper Company, it was found impossible for the mechanics to work on account of the fumes.

A local tinsmith made the helmets as shown in the accompanying illustration; inside of these the men worked in comfort, and without interference with their duties. The small rubber tubes are connected w h a compressed-air pipe and a stream of air flows into the helmet and out through the hole at the top.

Smoke "Divers" at Cananea

Dr. L. D. Ricketts, commenting on this device, says that he believes if such a helmet were provided with two tubes that it could be used to advantage in bad gas underground, by attaching one hose to an air pipe and advancing to a point where the other hose could be attached, and so on backward and forward.

Practical Limits for Concrete Buildings

In the course of the discussion on the comparative costs of mill buildings at the recent annual convention of the National Association of Cement Users, L. C. Wason brought out the point that there is a sharply defined limit of load which determines whether concrete or "mill construction" is the most economical. An example was cited of a factory building, built some years ago, in which economy was the first consideration. The floors were designed with 24-ft. spans to carry 800 lb. per sq.ft. and it was found that for these conditions reinforced concrete was by far the cheapest material. In general, the economic limit was stated to be 200 lb. per sq.ft.; for lighter loads, mill construction is generally considered cheaper.

The Alaska Coal Land Decision

Announcement was made on June 26 that Secretary of the Interior Walter L. Fisher had approved the decision of Commissioner Fred Dennett, of the General Land Office, which completely disallows the famous Cunningham coal-land claims.

The present approval of the Secretary is only informal, and will have to be made in formal manner, merely to complete the record, if appeal is made by claimants. It is announced also that the Cunningham claimants will appeal to the Supreme Court, but it is hard to see upon what point of law an appeal can be based.

Commissioner Dennett makes the final decision for the Department of the Interior, completely disallowing the Cunningham claims, on the grounds that the claimants did not act as individuals, but combined in the development of a tract amounting to over 5000 acres.

Claimants Did Not Act as Individuals

The decision of the commissioner was based on the facts that the 33 claimants established a common fund, which was used for general exploration work; that with one exception (Baker) the individuals seemed unconcerned with the situation or value of the individual claims; that such work as had been done on the claims was not for the purpose of opening a mine, but was merely opencut and tunneling with a view to getting the best idea possible of the value of the lands as a whole; and that a general agreement had been entered into for the financing of a $5,000,000 stock company by th Morgan-Guggenheim interests.

Inasmuch as entry on such lands is supposed to be by individuals for their own particular use and that actual development work is supposed to be performed, the above form fatal obstacles to the patenting of these claims.

Secretary Fisher's Statement

In speaking of the decision, Secretary Fisher emphasized the need of new laws to insure the proper development of the Alaska coal lands. In part, he said as follows:

"This is a final decision of the Cunningham claims, as far as the Department of the Interior is concerned. Any further proceedings will be merely formal for the purpose of perfecting the record, in case the claimants think there are questions of law which they desire to present to the courts. It is my understanding that it is conceded that the findings upon the facts by the Department are conclusive.

"It is the intention of the Department to proceed at once to a final determination of all the remaining Alaskan coal claims so far as this can properly be done, denying those that should be denied, and granting those that should be granted as rapidly as possible.

"I do not believe the present laws applicable to coal lands in Alaska are wise or practicable laws. Nevertheless, their provisions must be enforced, (1), because they are the law, and (2), because they afford the only protection to the public welfare against the abuses of monopoly and unrestricted private exploitation. I sincerely trust that these laws will be modified at the next session of Congress, so as to permit the development of the Alaskan coalfields under provisions that will more adequately protect and promote the public interests. If, however, there are claims now pending which, under the existing law, are entitled to patent, I see no justification for not taking action upon them as promptly as the Department can be assured that it is in possession of the facts upon which such action must ultimately be taken."

Commissioner Dennett's Opinion

Commissioner Dennett's reasoning *in extenso* was as follows:

"There seems to be no doubt that in the beginning the participants were 'subscribers' for 'joint interests,' and not owners of 'separate claims,' and that the substantial character of the transaction never changed. In 1905, they were still 'coöwners' of a single property, although in order to acquire it each particular claim had been allotted to a particular individual and had been entered by him in his name.

"The original agreement with the Guggenheims contemplated the formation of a corporation as soon as the titles were secured. This plan gave the Guggenheims the right to mine the coal on a royalty basis. The Guggenheims also were to build a railroad from the mines to the coast. As finally entered into, the agreement with the Guggenheims for a sale aroused serious objection from several of the claimants.

"The fact that it was represented to the Guggenheims that there were 33 independent claimants to be reckoned with, in no wise strengthens the defense. It is not to be supposed that any sane men representing these entrymen as a committee would suggest to a prospective purchaser of the property that the claims were illegal and the several entries subject to forfeiture.

"The amounts contributed by the several entrymen were substantially the same. If it was not understood there was to be a common profit, would the 16 upon whose claims nothing whatever was done have permitted the use of their funds for the development of the other claims, and would 32 of them have suffered their joint funds to be expended in driving the expensive tunnels on one claim?

"A further discussion of the facts is not necessary. They speak for themselves and speak plainly. There was not at any time a single act performed that connected any claimant with the precise tract he claimed to locate. There was not a dollar spent by any locator, individually or by agent, on the land he entered, but every act done and each dollar disbursed were for the purpose of determining whether the field as a whole contained workable deposits of coal. Prior to the hearing, 18 of the claimants admitted, under oath, that they proceeded from the beginning with the understanding that when the patents were secured they would form a company for the development of property.

"The plan from the outset was to acquire a coalfield at joint expense to be developed for the common benefit. There was not at any time a departure from this original compact save the substitution of the salary to Cunningham for the one-eighth interest he intended to secure in the several claims.

Only a Pretense of Complying with Law

"Carrying into effect the purpose of acquiring this coalfield for the common use and benefit of the members of the association, claims were located and entries made in the names of individuals, but the making of these locations and entries in the manner indicated were but incidents in the transaction, but means to an end, and the names of the individuals were used only to effect a colorable compliance with the law. They exercised no choice in the selection of their claims, manifested no interest in their individual values, and (except perhaps Baker) sought no information of their respective locations. The field jointly acquired by all of them and explored at the common expense was the only object of their solicitude."

"That all the work so far done was paid for from the common fund is not denied. It is admitted by the claimants, and frankly stated in the brief of their counsel, that one claim of 160 acres cannot be profitably worked, that sometime and somehow the claims must be operated together. Is it reasonable to sup-

pose that business men would agree to the common investment of their moneys jointly to explore a coalfield in Alaska, with the understanding that the several claims should be operated separately, or with no understanding with respect thereto? Would they consent to spend money jointly where there was to be no common profit?

PROOFS OF THE COMBINATION

"Knowing that an area of 160 acres could not be successfully operated and that the greater the area the more valuable the property, would men connected by ties of blood have consented that their claims be scattered throughout the field? Would men who had been associated as partners since their youth and had grown rich together have agreed to the placing of their claims at remote distances from each other? If each claimant was to receive a single tract and no interest in any other, would Cunningham have located the great majority of the men who first went into the scheme and made its success possible on the timber claims of the Southern tier, claims which possessed but little value as compared with the others? If there was no prior agreement, would Clarence Cunningham, in April, 1907, before many of the certificates were issued, have entered into negotiations with the Guggenheims looking to the disposition of the combined properties?"

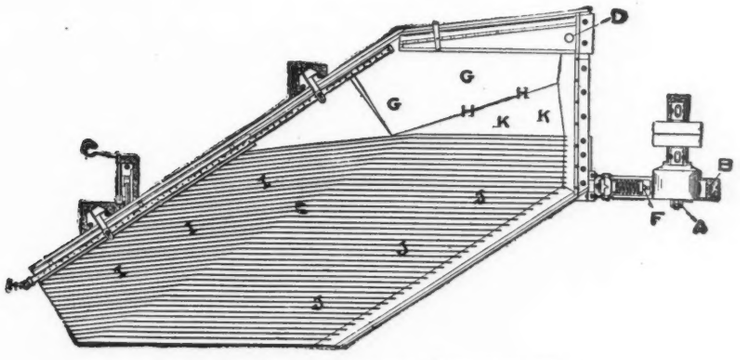
Thus, so far as the Department of the Interior is concerned, ends a controversy which virtually retired to private life the former Secretary, Ballinger, the chief forester, Pinchot, his aide, Glavis, and many subordinates, and which formed a constant incubus to the Taft administration. While the decision is being delightedly hailed as a definite end to the matter, there is an old saying as to the number of ways in which cats can be killed.

Shipments of phosphate rock from Egypt during 1910 amounted to 2186 tons, according to the *American Fertilizer*. About half of this production went to France, the remainder to England, Austria and Italy.

The James Diagonal Plane Concentrator

It is claimed by S. Arthur Krom[1] that the prevailing style of deep riffles on concentrating tables is incorrect, and that great improvement is possible. It is argued that the action of any form of riffle is principally to upset and retard the process of settling and stratifying the various minerals on the table deck. Each time the material is forced over a riffle it is an even chance whether the heavy or the light particles get to the bottom first, or, more likely still, they will mix and again have to be stratified. Furthermore, Mr. Krom regards it as a defect that the line of motion should be parallel to the riffles, as this means that there is no action to counteract the downward flow of the heavy minerals, to aid in their separation from the gangue matter.

These objections are believed to be overcome in the so called diagonal-plane table of U. S. James, of Newark, N. J. In this table the upper portion of the deck consists of two planes at different inclinations, meeting in a line diagonal to the line of motion of the table, while the lower has only slight riffles on it. An accompanying illustration shows the plan of this table top, *G G* and *K K* being the two planes, and *H H* their intersection.



JAMES DIAGONAL-PLANE CONCENTRATOR

The flow of material over the first plane is checked by the second, thus forming a sort of settling basin in which minerals of high specific gravity are settled and classified before the feed arrives at the riffles. The riffles on the portion of the deck, *I I* are low, 1/32-in. high, which allows the concentrates from the settling basin to spread out, enabling any gangue remaining in them to be washed out.

The line of motion is diagonal to the line of settlement, and the concentrates are driven forward and upward against the inclination of the table, thus counteracting the tendency of the dressing water to wash the concentrates into the tailings section.

[1]*Bull.* A. I. M. E.

The tailings do not come in contact with the high riffles until freed from valuable minerals, which reduces their function to that of merely preventing too rapid a discharge of tailings and water. The adjustment provides for a wide range of movements, both as to kick and stroke.

Increasing Costs of Rand Mining

With the ever increasing depth of the mines on the Witwatersrand, and consequent increase in the cost of bringing the ore to the surface, accompanied by a steady but insistent decrease in the value of the ore deposit, the profit derivable from the exploitation of the mine at great depths[1] tends to taper off and must disappear entirely when working costs plus capital charges equal the value of the gold recovered.

The average depth from which ore is mined today is estimated to be in the neighborhood of 2400 ft. Some mines are worked at a comparatively shallow depth; others obtain the ore from below 3500, and even 4000 ft. With working costs remaining at the present standard, the end of profitable mining would be reached at, or below a vertical depth of 5000 ft. The present value of the gold recovered per ton of ore milled is about 28s., and working costs, including development redemption, but not including capital charges on the surface equipment, are about 17s., leaving a gross profit of 11s., of which about 9.5s. are available for dividends, after allowing for the profit tax. The working costs per ton are: Mining, 18s. 9d.; reduction, 5s.; general expenses, 1s. 3d.; and 2s. for development redemption.

The position in the present year, compared with 1905, is represented as follows, wherein the first figure given is for the year 1905, while the second is for the year 1911: Yield, 35.7s. and 28s.; working costs, 24s. and 17s.; capital redemption, 5s. and 4.5s.; total cost, 29s., and 21.5s.; profit, 6.7s. and 6.5s.; profit tax, 0.67s. and 0.65s.; leaving a total company profit of 6.03s. in 1905, as compared with 5.85s. in 1911.

The results were obtained chiefly at the expense of mining costs and it is hardly expected that these will be able to keep pace with the reduction in grade due to the lower value of the ore deposit at greater depth. It is assumed rather that mining costs will rise, owing to the increased cost of skilled and unskilled labor, as more time will be lost in reaching the working face, and with rising temperature labor may become less efficient. Costs of explosives will increase, owing to the increased hardness of the rock, requiring

[1]Abstract of a paper entitled, "Future Economies in Rand Reduction Plants," read before the Institution of Mining and Metallurgy, by C. O. Schmitt.

the use of larger quantity of powder. The provision of artificial ventilation, rendered necessary to maintain the efficiency of the laborers, will entail an additional charge. Furthermore, mine drainage charges must obviously increase with the depth of the workings; hoisting rock to the surface will be an item increasing at accelerated rate with depth; two stages of winding will be required, with greater wear on skip, rope and track, and cost of power will increase, due to duplicate transmission cables, loss in transmission, etc.

In deep mines, owing to sinking costs, shafts will be farther apart than is now the case, the result being that the distances over which ore must be transported underground will be greater; the power underground will involve increased costs; this will be most evident in the cost of compressed air, because not only will frictional losses increase by the use of longer pipe lines, but more air will be required for drilling holes in the harder rock, and the expenditure on winding plants, power mains, water mains, ventilating plants and shaft sinking naturally increases with the depth of the workings and in no small degree.

While the task of substantially reducing working costs and capital charges is by no means an easy one, it is considered, that in view of the magnitude of the interest involved, such a task is worthy of the most serious consideration by all concerned in the mining industry. It is stated that economy may result from modifications in the sorting and screening plant, from which it appears that the greater portion of the saving effected will be due to a redistribution of work in the milling or crushing plant. In regard to crushing, it is stated that the single-stage crushing costs 22.184s. per ton, as compared with 13.956s. for double-stage crushing.

Motor for Stamp Mill Drive

The Westinghouse company has adapted its standard motors to belt directly to a battery of 10 stamps. A 25-h.p. motor is placed in a special back-gear cradle, which carries a countershaft on which is mounted a gear and pulley for especially slow belt speed.

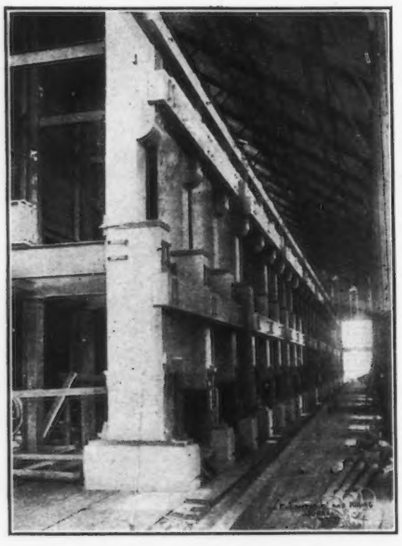
The cradle and gear case are standard, but a smaller motor can be used if desired. The split bearings with the back-gear shaft make it possible readily to inspect or change these bearings after slacking off the belt. The motor, gear and pinion can be replaced or taken away for repairs without disturbing the line-up of the pulleys and without handling the extremely heavy belt. A long sliding base is furnished to take up the stretch of belts.

This combination of motor drive for each battery of stamps has the advantage of dispensing with the long line of countershafting, and its consequent vibration and friction losses, and of permitting the shutting down of the complete battery when out of service.

The Brakpan Mines, Ltd.

JOHANNESBURG CORRESPONDENCE

The Brakpan Mines, Ltd., has been one of the most fortunate of the deeper level undertakings on the Rand. Two vertical, four-compartment shafts were sunk in record time to a depth of between 3000 and 4000 ft. without any hitch and were connected by an incline 4000 ft. long on the reef, driven both ways which connected most accurately. The area of the property is 1150 claims and the dip of the reef is about 10 deg. An expenditure of about £950,000 has been sufficient to open the mine and develop 1,913,000 tons of profitable ore assaying 6.6 dwt. over a stoping width of 52½ in., and 854,000 tons of unprofitable ore assaying 2.08 dwt. The average value of all reef exposures is 8 dwt. over 33.6 in. width.



TIMBER BATTERY POSTS IN NEW BRAKPAN MILL

This £950,000 also provided for the erection of a 160-stamp mill with tube mills. The stamps weigh 1650 lb. Screens are placed behind the mortar to separate material finer than 5-mesh and pass it direct to the tube mills. Elevation of the pulp is accomplished by Robesen's centrifugal pumps. Amalgamation is accomplished on plates below the tube mills. Blaisdell distributors are used at the sand vats and a Bleichert aërial haulage, similar in principle to that installed on the Langlaagte Estates, is provided for stacking residues, the cost being guaranteed not to exceed 3c. per ton. Pachuca tanks are employed for slime treatment with Butters vacuum filter plant, while Merrill filter presses and zinc dust will be used for precipitation of gold from solutions. The capacity of the plant will be about 60,000 tons per month. Over 60,000 cu.yd. were excavated; 9000 tons of concrete laid; and two million bricks, 10,500 ft. of ironwork and 138,000 cu.ft. of timber used. The accompanying illustration shows that timber framing was retained for battery posts; that the stamp boxes are of the low open-front type, and that the bin framing is steel.

Magnesium

The consumption of magnesium in the United States in 1910 did not exceed that of the previous year, the total probably being valued at not more than $12,000. This metal, however, seems destined to have a much wider use in the near future, because magnesium has been found to be of greater value in refining steel than aluminum, and also because of the great interest now being aroused by the remarkably light and strong alloys which are produced by the proper admixture of small amounts of zinc with magnesium. These alloys are reported to be stronger than the aluminum alloys and have a specific gravity of about 1.8, as compared with 3 for the lightest commercial alloys of aluminum. Thus, the magnesium alloys weigh only 60 per cent. as much as the aluminum alloys, and are already reported to be finding an extensive use in aëroplane manufacture.

The alloys of magnesium with from 2 to 4 per cent. zinc can be wrought and rolled, and present the fracture of fine steel. Various degrees of hardness and corresponding coefficient of expansion can be obtained. The alloys can be readily cast and turned like brass or copper, without the use of soap or petroleum, and they resist the action of air and water.

In view of the fact that bulk for bulk magnesium can be manufactured for a less cost than aluminum it is destined to become a strong competitor of the latter metal wherever its characteristics of great lightness are desirable.

Magnesium has been selling for about $1.25 per lb. in the United States, but it is expected that this price will be reduced to about 50c. in the near future. The Virginia Electrolytic Company, at Holcomb's Rock, Va., is perfecting its process for the manufacture of magnesium, the outcome of extensive experiments by Messrs. F. von Kugelgen and George O. Seward, and expects shortly to become a considerable factor in the newly awakened marked for this metal and its alloys.

It is stated that Etienne Boyer of Marseilles, France, and associates, including Frederick Camors, of New Orleans, have purchased 5000 acres near Edgerley, La., and will test the property for sulphur deposits with a view to development. This land is in Calcasieu parish, where are the salt mines of the Louisiana Sulphur and Mining Company.

Gold Ores of Washington and Oregon

By Francis Church Lincoln *

A review of the geologic conditions in the Republic and Monte Cristo districts in Washington, and the North Pole shear zone in Oregon, which have furnished most of the gold produced by these States.

*Mining engineer and geologist, 104 John street, New York.

Washington and Oregon rank ninth and tenth among the States as producers of gold, their respective productions for 1910 having been estimated[1] at $711,359 and $631,173. Washington contains two economic gold deposits of exceptional geologic interest, the seleniferous gold veins of the Republic district and the joint-crack deposits of the Monte Cristo district. Oregon has been an important source of gold, the eastern portion of the State having produced approximately $65,000,000[2]. The North Pole shear zone in argillite is the most important deposit.

Tertiary Propylitic Veins

The veins of the Republic district are of special interest on two accounts. In the first place, they constitute the northernmost economically important representative in the United States proper of the group of late Tertiary propylitic veins in effusive eruptive rocks which includes both gold and silver lodes and has numerous members to the south in the United States, Mexico and South America. North of the Republic district no deposit of importance is known until the Apollo lode on Unga island, Alaska[3] is reached. Across the Pacific similar goldfields occur in Japan, the Dutch East Indies and New Zealand. The other interesting point is the occurrence of a considerable amount of selenium with the gold. Selenium also occurs in association with the gold ores of Goldfield, Nev.; Redjang-Lebong, Dutch East Indies; Waihi and Great Barrier, New Zealand; and Falun, Sweden. With silver ores the gold of which is of subordinate value, it occurs at Tonopah, Nev., and in several Mexican and South American districts[4].

Republic Camp Opened in 1896

The Republic district[5] is situated in northeastern Washington 20 miles south of the Canadian boundary. It formed part of the Colville Indian reservation, which was opened to mineral entry, Feb. 21, 1896. George and John Welty, who had camped upon the ground all the previous winter, brought into the district Philip Creaser and Thomas Ryan, who had been grubstaked in Rossland, B. C. Creaser and Ryan located three claims on Feb. 29, and within two weeks all the important claims in the district had been staked. The New Republic ground was taken up on March 5, 1896.

In the early days of the camp, the high-grade ore was hauled 80 miles to the railroad at Marcus. Attempts to treat the low-grade ore on the ground were not wholly successful. A 30-ton Pelatin-Clerici cyanide mill was installed in 1898, and the following year this plant was dismantled to make room for 200-ton mill designed for cyaniding roasted ore, which latter plant was in operation less than a year. Both mills were expensive to operate and did not make satisfactory recoveries. After the abandonment of milling operations, there was a temporary revival of mining due to the advent of the railroads in 1902 and 1903, but smelting rates were so high that it was not until 1909, when contracts for a period of years were made with the smelters, that operations were resumed on a large scale.

The total production of the camp up to 1910 was approximately $2,000,000, of which 90 per cent. was gold. The New Republic mine produced about $1,400,000 of this amount, mostly between 1897 and 1902. The town of Republic has a population of 1500 and is the county seat of Ferry county. It is accessible by two railroads—the Republic & Kettle Valley Railroad and a branch of the Great Northern system. The camp is situated on Granite creek near its confluence with the San Poil river and at an elevation of 2500 ft. The New Republic mine is just south of the town and at the same altitude.

The surface in the Republic district is rugged. Many branching streams flow through valleys from 2500 to 3000 ft., deep. From these stream valleys steep slopes lead up to the mountains, which are of fairly uniform elevation and all have rounded tops. The New Republic vein outcrops at the crest of an elongated mound on the east slope of Copper mountain, which lies on the west side of Granite creek. The climate is semi-arid and neither winter nor summer temperature is extreme. The rainfall is about 18 in. and the streams carry sufficient water for mining and domestic purposes. A forest growth of evergreen trees covers the greater part of the district.

Rocks of the Republic District

The oldest rocks exposed in the Republic district are the metamorphic equivalents of a great series of shales, sandstones, limestones and lava flows of Paleozoic, (perhaps Carboniferous), age. These rocks were metamorphosed and raised above sea level and either during this crustal disturbance or shortly thereafter great batholithic masses of granodiorite were intruded into them. The intrusions took place in early or middle Mesozoic time and were succeeded by a long erosion period lasting till the middle Tertiary and divisible into two stages, one by which the entire area was reduced to base level in Eocene time, (now shown by the general accordance of mountain summits), and a second by which after reëlevation of the Eocene peneplain broad valleys at least 2500 ft. in depth were developed.

One of these valleys was occupied by dacite flows and included stream gravels of Oligocene age. Overlying these, unconformably, are andesite breccias, lake beds and andesite flows. These early Miocene deposits form the wall rock at the New Republic mine. Next in order of age come intrusive latite porphyries with which the ore deposits are thought to be genetically related. Erosion ensued, interrupted by a short period of basaltic eruption. In Pleistocene time the entire area was covered by Cordilleran ice.

Two Contemporaneous Vein Systems

The fissure veins of the Republic district occur in Tertiary dacite flow conglomerate, andesite flow breccia and latite porphyry. They were formed in Miocene or Pliocene time, susequent to and probably in connection with the intrusion of the latite porphyry, by hot ascending waters rich in silica, lime and potash, and carried subordinate amounts of sulphur, iron, copper, gold, silver, selenium, tellurium and fluorine. The productive belt is about five miles in length in a north-south direction and one mile in breadth. Within this belt there are two vein systems: a north-south system of which all but one dip east, and a northeast-southwest system most of which dip southeast. The veins of the first system vary in length from less than 100 to 4000 ft., while those of the second never exceed 1500 ft. in length. The two systems are thought to be approximately contemporaneous, since the northeast-southwest lodes abut against the north-south lodes but in no case continue on the opposite side.

The New Republic vein strikes north 4 deg. east. At the north end of the

[1] Eng. and Min. Journ, Jan. 7, 1911, p. 3.
[2] Eng. and Min. Journ., Jan. 7, 1911, p. 55.
[3] Eng. and Min. Journ., Sept. 17, 1910, p. 551.
[4] *Professional Paper*, 42 (1905), p. 281, U. S. Geol. Surv.
[5] *Bull. I*, 1910, Washington Geol. Surv.

claim it splits into stringers, but at the south end it continues well defined beyond the limits of the property. Its dip is 60 deg. east, and it has been explored to a depth of 400 ft. The width varies from 2 to 8 ft. Spur veins narrower than the main vein occur in the foot-wall. They never extend more than 15 ft. from the main vein, and when they differ in dip always diverge upward like the limbs of a tree. The vein is crustified, the bands being roughly parallel with the walls. In detail, however, the banding is found to be somewhat irregular and concentric crustifications occur from a fraction of an inch to several feet in diameter. Sharply defined angular fragments of country rock occur in the vein. Silicification of the wall rock has taken place near the vein and calcification farther away. Calcite has been developed after feldspar and hornblende, and chlorite after hornblende and biotite, while secondary pyrite has been formed extensively.

Republic Ore Is of Medium Grade

The district contains large deposits of $7 ore and comparatively limited amounts of $12 ore. Some high-grade rock is said to have been taken from the New Republic mine. The ore does not amalgamate nor cyanide well and smelting seems to be the best method of treatment. The ore occurs in shoots pitching steeply to the south and containing kidneys and ribbons of high-grade ore lying parallel to the walls. Rich ore occurs in the spurs as well as in the main vein. In the unoxidized portions of the veins ore may be distinguished from waste by its appearance. Where gold and silver occur, there are found intermixed with the wavy ribbons of bluish-gray vein filling other ribbons of bluish-black color and sub-metallic to metallic luster.

Ninety per cent. of the vein filling is quartz. A considerable amount of adularia (the vein variety of orthoclase) is found, mainly in the form of microscopic crystals. There is also some calcite present and occasionally gypsum and an acicular calcium-magnesium salt. The bluish-black ore ribbons viewed under the microscope are found to contain disseminated aggregates of small opaque specks which as a rule are indeterminable. Pyrite and chalcopyrite are the principal exceptions, although one small crystal of fluorite and two resembling titanite have been observed. A dark metallic mineral present in these bands is thought to be silver-antimony sulphide. Selenium in some form is also present.

The ratio of gold to silver is 1:1 at the surface and 1:6 on the lower level. All of the gold which is not free, and some of the silver, is thought to be associated with the selenium. In this connection it may be of interest to recall that the form of the gold at Tonopah, where selenium occurs in the ore, is an as yet unsolved problem, but that at Goldfield the selenium is present in the mineral goldfieldite, which has been found intergrown with native gold[6]. Again, the form in which the gold occurs in the seleniferous ore of the Redjang-Lebong mine, Sumatra[7], has never been ascertained, but in the Falun mine, Sweden[8], it is intimately associated with seleniferous galenite.

Joint Crack Deposits of Monte Cristo

Monte Cristo[9] lies in the heart of the Cascade range in central Washington, 40 miles east of the city of Everett on Puget sound. The two principal mines, the Mystery and Pride, are owned by a single company which is controlled by the capitalists who built the smelter at Everett and the Everett & Monte Cristo Railroad which connects Monte Cristo with the outside world. The camp has not been very active recently, owing to the lowering of the grade of the ore with depth. The town lies in the valley of the head waters of the Sauk river on the western slope of the Cascade mountains at an elevation of about 3000 ft. above sea level, while the mines are about a thousand feet higher up the slope. Deep, narrow gulches are tributary to the valley basin, and the slopes of the mountains are quite steep. The higher mountains contain fields of perpetual snow and small glaciers.

The country rocks exposed in the Monte Cristo district are of Tertiary and Quaternary age and consist of an Eocene sedimentary series and a later series of volcanic rocks ranging in age from Miocene to Pleistocene. The sedimentary series comprise several thousand feet of arkoses, conglomerates and quartzites believed to have been derived by the erosion during early Tertiary time of the Mesozoic granite rock which in the Republic and other districts has been found to make up the core of the Cascade range. Following the deposition of the sedimentaries came a long period of volcanic activity. This began by the extrusion of andesite, followed by tonalite intrusion, which was succeeded by a period of erosion. Scanty rhyolite was then extruded, followed by abundant olivine-basalt flows. The rocks were then folded and eroded and a later andesite flowed out upon the erosion plain. Before the completion of the extrusion of the later andesite, the region was elevated. Profound fracturing and slight faulting accompanied the uplift. A period of erosion followed.

Gash Veins Prevalent

The ore deposits of Monte Cristo occur mainly in joint cracks and, therefore, belong to the class commonly termed "gash veins." While jointing is developed equally in all the rocks of the district, the ore has been deposited chiefly in or near the tonalite and to a less extent in the andesite and other igneous rocks, while the sedimentary arkoses contain little. It is of interest to note that the Monte Cristo tonalite is of similar geological age and chemical composition to the Republic latite to which the ores of that district are genetically related. The Monte Cristo ore is believed to have been formed since the last elevation of the district, deposition having begun with the dissection of the plateau in late Pliocene or Pleistocene time and continued until the present day. According to Spurr's hypothesis, the ores have been leached from the surrounding rocks by downward percolating waters, which have later precipitated their mineral contents in favorable localities. The ore is often especially localized at the intersections of fractures and areas of profound fracturing are generally the areas of greatest mineralization.

On account of the narrowness of the fissures, replacement has been of much greater importance than fissure filling. The first stage of alteration of the tonalite is represented by the change of feldspar to sericite and ferromagnesian minerals to glaucophane. In a more advanced stage the quartz grains increase in size and the feldspars and ferromagnesian minerals are replaced by calcite, kaolinite and sulphides. The changes in the andesite are somewhat similar, save that epidote develops in preference to glaucophane.

Gold and Silver Occur with Sulphides

The ores carry small amounts of gold and silver. The surface ore from the Monte Cristo mine contained 0.95 oz. gold and 12 oz. silver per ton and the deep ore 0.6 oz. gold and 7 oz. silver. Owing to the nature of the deposit, the shoots are extremely irregular in shape. The ore differs from the altered country only in its increased sulphide content.

The principal ore minerals are pyrite, pyrrhotite, arsenopyrite, sphalerite, galenite and chalcopyrite, while the rarer ones include chalcocite, bornite, molybdenite and stibnite. Realgar has been produced by the alteration of arsenopyrite and among the oxidation products of the sulphides occur malachite, limonite, hematite, melaconite and scorodite. The gangue minerals are the minerals of the altered country rock, quartz and calcite being the most important.

There is a rough succession of the minerals in the order of their solubility which from the surface down is galenite, sphalerite, chalcopyrite, pyrite and arsenopyrite. The upper zones, characterized by galenite, sphalerite and chalcopyrite carry more gold and silver than the lower ones characterized by pyrite

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[6] *Professional Paper*, 66 (1909), U. S. Geol. Surv.

[7] *Trans.* I. M. M., 10 (1902), pp. 53 and 12 (1903), p. 341.

[8] "Gold," Maclaren, p. 197.

[9] *Annual Report*, 22, Part II (1901), pp. 777-865, U. S. Geol. Surv.

and arsenopyrite. The order of deposition of the minerals was as follows: First, arsenopyrite, pyrite and quartz were deposited; then chalcopyrite, pyhotite, sphalerite, galenite and quartz; and finally realgar, stibnite, molybdenite, chalcopyrite, quartz and calcite. The gold and silver occur chiefly in the sulphides. Of these, arsenopyrite carries the most gold and pyrite and galenite the most silver. Pyrrhotite is comparatively barren, while realgar contains neither gold nor silver.

North Pole Shear Zone in Argillite

The most important goldfield of Oregon is situated in the Blue mountains in the northeastern part of the State. The best known mines of the Blue Mountain belt are situated on the North Pole shear zone[10] in the Cracker Creek district. The principal settlement is Bourne, six miles north of Sumpter, which is on a branch of the Oregon Railroad and Navigation Company's line from Baker City. The placer deposits of the Blue mountains were discovered by a prospector named Griffin and a party of men in 1861. In 1862, D. Littlefield and his party discovered the rich placers of Auburn. Notwithstanding the difficulty of access at that time, the population grew to 5000 in less than a year. Using Auburn as an outfitting point, prospectors scoured the Blue mountains and discovered practically all the mining districts by 1864. Quartz mines were found early, the Virtue being discovered in 1862.

The country was first made readily accessible by the construction of the transcontinental railroad in 1885, and its active development dates from that year. In 1889 the lode mines first made a notable production, and it was in the same year that the Cracker Creek district was first considered worthy of exploitation. There are four mines on the North Pole lode in this district which, in order from northeast to southwest, are the North Pole, Eureka and Excelsior, Columbia, and Golconda. Previous to 1880 the production of the Blue Mountain belt is but imperfectly known, and even since that date there have been many blanks in the records. The goldfield is located in Baker, Grant and Union counties, and the production of gold from both deep mines and placers in these counties from 1880 to 1908, inclusive, was approximately $24,000,000. The total production of the North Pole shear zone, known locally as the "Mother Lode," was estimated in 1908 to have been at least $7,000,000.

The Cracker Creek district is mountainous. The valleys, generally V-shaped, are sometimes U-shaped in their upper courses. They are separated by steep rugged ridges from 1000 to 2000 ft. in hight, which have narrow, somewhat serrate summits. The elevations range from 5000 to 8400 ft. above sea level. At Baker City the temperature is moderate and the climate dry. Going west toward Cracker creek rain fall and snow fall increase rapidly with the elevation until summer showers become frequent and winter snows are from 5 to 15 ft. in depth. The timber is of poor quality, consisting mainly of black pine and tamarack.

The Sedimentary Rocks

The country rock consists of sediments probably of Paleozoic, perhaps Carboniferous, age, which form an apparently conformable series. The members of this series range from cherts to clay slates and either grade into one another or occur interlaminated. An interbedded greenstone, 600 ft. in thickness, is also present. To the north and northwest the sediments are cut off by intrusive granodiorite. Altered feldspar-porphyry dikes cut both granodiorite and sedimentary rocks. A few aplitic dikes and serpentine masses also occur. Pleistocene morainal deposits have been formed in the creek valleys.

The North Pole lode is a mineralized shear zone in hard, black, silicious argillite. The lode was probably formed in early Cretaceous time by hot ascending waters of magmatic origin containing a considerable amount of carbon dioxide and alkaline carbonates. It belongs to a system of linked lodes, the Elkhorn-Cracker Creek-Cable Cove system. The lode has a general northeast-southwest strike, but is curved. It is continuous for at least four miles and occupies a normal fault which extends beyond the limits of the district. It dips 70 deg. to the southeast and displaces the country 400 ft. vertically and 1800 ft. horizontally, the movement having taken place along a line in the vein pitching gently southwest. In width it varies from 5 to 500 ft. with an average of about 25 ft., but although it occupies a shattered area of such variable width, the North Pole shear zone commonly has well defined walls. Fractures and fissures have been filled and in some instances the filling exhibits comb structure. Metasomatism of the country rocks has taken place, the slates having been pyritized and to a slight extent silicified and the porphyry dikes in the slates sericitized and carbonated. Faulting has taken place within the vein subsequent to its formation.

Character of Gold Ore Varies

The character of the ore varies considerably in the different mines on the lode. In value it averages from $6 to $15 per ton with occasional carloads running as high as $1000 per ton. From 6 to 50 per cent. of the gold is readily amalgamable. Concentrates make up about 10 per cent. of the ore and range in value up to $200 per ton. The pyrite formed metasomatically in the country rock is always poor in gold and silver, so that the core consists mainly of cavity fillings. Four large ore-bearing shoots are known, three of which had been explored at the time of Lindgren's examination. These were each several hundred feet in stope length, from 2 to 12 ft. in width, and were separated by long stretches of barren ground. Two of these shoots pitched from 20 to 30 deg. to the southwest and the third was irregular, insofar as explored. The gentle southwest pitch common to both fault movement and oreshoots is suggestive.

Within the large ore-bearing shoots, the ore is confined to smaller and more definite oreshoots which usually have a width of from 1 to 4 ft. These may occur on either the foot or the hanging wall, cross diagonally from one wall to the other, or form several distinct stringers. These oreshoots are lens-shaped, frequently overlapping, and bounded by fault planes filled with thinly laminated, striated, black gouge.

The Principal Minerals

A small amount of sulphides is present in the ore and lacking in the waste, but otherwise there is no apparent difference between the two. The ore minerals occur finely divided in quartz. Arsenopyrite, marcasite and pyrite are by far the most important. Chalcopyrite, galenite and sphalerite are uncommon. Among the rarer minerals are cinnabar, tetrahedrite, mercurial tetrahedrite, stibnite, hessite, sylvanite, native copper and pyrargyrite. A small amount of calcite occurs with quartz as a gangue, and more rarely chrome mica and vanadium mica are found. Examination of the ore shows that primary quartz and arsenopyrite were crushed and recemented by quartz containing sharply defined pyritohedrons of pyrite. In narrow cracks in quartz of both ages, calcite pyrite and arsenopyrite occur.

Gold Mostly in Sulphides

The finely divided sulphides are usually rich in gold. Native gold is seldom seen. Rich pockets contain pyrite, chalcopyrite, tetrahedrite, native gold and sometimes telluride, in a gangue of quartz and roscoelite (vanadium mica). Rich ore from the North Pole mine shows hessite filling cavities in quartz which are sometimes lined, next the quartz, with native gold and more rarely with a pale yellow telluride which, in one instance, adjoins the gold. These three minerals seem to be contemporaneous and are said to occur in apparently primary quartz. In the Columbia mine native gold occurs intergrown with colorless or brownish sphalerite and with tetrahedrite but not with pyrite, and is also found intergrown with roscoelite.

[10] *Annual Report* 22, Part II (1901), pp. 561-776; *Bull.* 380 (1909), pp. 85-93, U. S. Geol. Surv.

Machinery Brake Linings

Prof. C. L. Norton, of the Massachusetts Institute of Technology, recently made some exhaustive tests of machinery-brake linings, the results of which are of interest. They indicate that asbestos is a superior material for this important part of certain machinery, such as hoists and other apparatus, where speed control is essential. In making these tests, the different materials used in brake bands were applied under the speed conditions of the ordinary brake drum.

The normal contact pressure and the tractive force were carefully measured. The arc of contact and the pressure per unit of area were varied over wide limits. Each specimen was tested when new and after several days' running. In the case of the asbestos lining the coefficient of friction did not vary sensibly with the pressure per unit of area or the length of the arc of contact. The final results showed that the two specimens of asbestos lining, supplied by the Johns-Manville Company, 100 William street, New York, showed a coefficient of friction of 0.37. The relative value of asbestos linings to other linings may be found in an accompanying table.

TESTS ON BRAKE-LINING MATERIAL

Material	Coefficient of Friction		
	Dry	Wet	Oily
Asbestos to metal	0.37	....	0.20 to 0.25
Metals on metal	0.15 to 0.24	0.31	0.20 to 0.06
Wood on metal	0.20 to 0.62	0.24	0.20 to 0.06

Oil was applied to these asbestos brake linings without any great effect. While it was possible by forcing oil between the asbestos lining and the metal drum to bring the coefficient of friction down as low as 0.20, it was found that a fair value for the coefficient of friction of the asbestos brake linings after they had been soaked in oil or exposed to splashing from oil is from 0.20 to 0.25. Values as high as 0.30 are not infrequent for an oiling lining used under high pressure.

Even when the asbestos brake lining was thoroughly saturated with oil, the coefficient of friction, although it went down materially upon the first application of the brake, was not greatly affected. It is to be noted that under the heat of the friction when the brake was again applied to the drum, the oil was quickly volatilized and the coefficient of friction was rapidly raised toward the maximum when dry.

An asbestos brake block was tested under similar conditions. It proved to have a more variable coefficient, depending upon the nature of its contact surface. The limits observed were 0.32 and 0.39. Professor Norton also brings to mind, that in comparison with the working efficiency of other materials, while certain materials when dry show a coefficient of friction comparable with that of asbestos on metal, it will be noted that these go down materially when wet or oily. For instance, wood and metal may run as high as 0.62 when dry, but becomes practically valueless when oily.

An Air Cooled Gasolene Hoist and Compressor

By W. B. Ross*

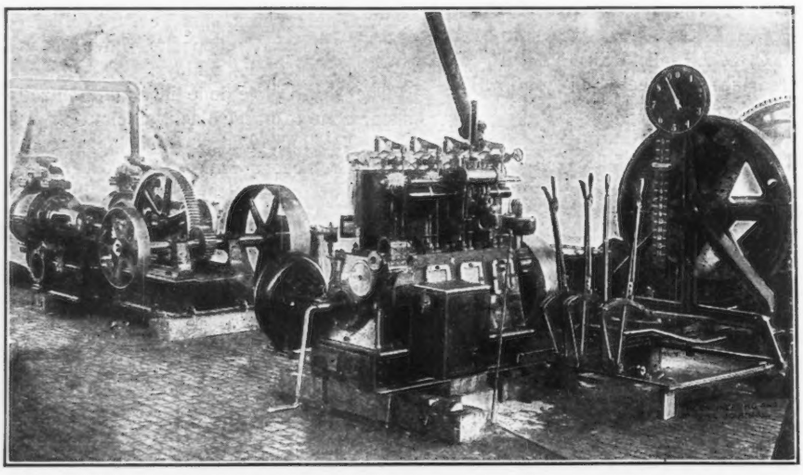
To provide in arid regions a mine power plant that does not require water, John R. Steele, superintendent of the Blackbird Copper and Gold Mining Company, of Utah, has invented a combination air-cooled gasolene engine, hoist and compressor. The design has been worked out by the inventor's brother, Samuel Steele, at the Dubois Iron Works, Dubois, Penn., where the apparatus has recently been built and successfully tested. The equipment will soon be shipped to the Blackbird mine, near Newhouse, Utah.

It is believed that this plant will be found of value in those countries where water has to be piped long distances and where fuel is packed for many miles. It does away entirely with boilers, and for lightness, compactness and economy of fuel, excels most motors now in use. The plant can be run by one man.

The fuel used is either gasolene, distillate or kerosene. The engine has four cylinders, 6-in. bore, 8-in. stroke, and is rated at normal speed at 60 h.p. It is cooled by a forced draft, supplied by a blower driven from the crank shaft of the engine. The air is distributed to the cylinders by specially designed conduits, after which it passes over the longitudinal vanes in the cylinders, these being jacketed.

The main exhaust valves are situated in the head and are supplemented by auxiliary exhausts. The inlet valves are situated in the pockets on the side of the cylinder. A single governing valve supplies the inlet valves. The governing valve is of the rotating type and is controlled by a ball governor. The speed of the engine can be instantly regulated by the adjustment of a small screw on the top of the governor, easily accessible to the operator while the engine is in operation. The mixing of the fuel is done by a standard carbureter.

The hoist has a capacity of 1500 ft. of rope, and is capable of lifting 6000 lb. at low speed. It is driven by a shaft connected to the engine by a clutch coupling operated through speed-changing transmission gears. There is also provided a special clutch between the transmission and the engine to facilitate the changing of speed. The hoist is provided with a dial for registering depths, the disk showing depth by tens and the upright by hundreds of feet.



Steele's Air Cooled Gasolene Engine, Hoist and Compressor Installation

The air compressor is of the two-stage type. Its cylinders are cooled by forced draft, from the same fan as is used for the hoist. The compressor has a capacity of 215 cu.ft. of free air per minute, at normal speed. It is driven by belts from the engine. The control of the plant is within reach of the engineer from his seat, and the air compressor can be thrown out automatically by throwing on the hoist or *vice versa*, but the hoist and the compressor can be operated at the same time when the hoist is running light.

*Dubois, Penn.

The shipments of phosphate rock during 1910 from Christmas island is reported by the *American Fertilizer* as 137,700 tons, against 105,400 tons during 1909.

Present Conditions at Tonopah Mines

By Claude T. Rice

The success of the campaign of extensive development by the Tonopah-Belmont company has stimulated others to similar work with the result that much high-grade ore has been found.

In this article I shall try to describe in a broad way the present condition of the mines at Tonopah, hoping that possibly other engineers will describe other camps in a somewhat similar manner, for in this way reliable and unprejudiced information will accumulate in regard to the larger mining camps to take the place of the broker's twaddle, now about the only detailed studies of mining properties available to the public. Tonopah is not an easy camp to treat in this manner, but fortunately it is one in which the different companies are quite willing that the public should know in detail how development is progressing. Indeed, the camp is conspicuous in that each week the local mining paper, the Tonopah *Miner*, publishes detailed outlines of the developments, obtaining this information from officers of the companies so as to insure accuracy. Moreover, the good fortune attending the renewed activity in prospecting, which has resulted from the finding of the new orebody in the Tonopah-Belmont, promises to make the camp toward the end of the year, one of the most active districts in Nevada, and therefore one well worthy of attention at this time.

Working Conditions

While mining conditions are in general favorable, Tonopah suffers many of the disadvantages inherent to the desert. Fortunately, the walls of the veins stand exceedingly well owing to the dryness of the workings, and orebodies in some instances have been mined to a width of 30 ft. with little support to the walls, so that in most of the mines little timbering has to be resorted to. Luckily, also, water has been developed in good quantity nearby so that there is now an ample supply for milling the ore near the mines, instead of going to Millers as was thought advisable in the early days of the camp.

The cost of mining varies greatly with the dip and width of the vein. In the Montana-Tonopah, where narrow veins are worked and much prospecting and frequent starting of new stopes is necessary, the mining costs $3.42 and development $1.81, making a total of $5.23 per ton, exclusive of general expense, while cyanidation and concentration costs $3.73, so that the cost total is $9.85 per ton. The heads for 1910 averaged $15.22 and the tailings $1.40, showing an extraction of 90.8 per cent. At the Belmont the cost of mining has been rather large, owing to the long tram to the old shaft, and the comparatively small tonnage handled. But with the new equipment in operation, the cost, when working at full capacity, should be as low or lower than that of the Tonopah Mining Company, as the economies resulting from the greater width of vein should more than balance the increased expense of timber used in mining the Belmont ore.

The costs at the Tonopah Mining Company for the fiscal year ended March 1, 1911, were: Mining, $3.95; milling, $2.94; freight on ore to mill, $0.63; marketing mill products, $0.73; a total of $8.25 per ton. Tailings had a value of $1.82 on heads that assayed $21.98 per ton, showing an extraction of 92.4 per per cent. At the Tonopah Extension the mining costs $3.11 per ton, milling $3.17 and marketing $0.535 per ton. The heads assay $13 per ton and an extraction of 91.87 per cent. is made. These costs are thoroughly typical, although at the smaller mines, which have no mill to enable them to mine the low-grade ore, the costs are somewhat higher, as the tonnage marketed is small.

The Tonopah Mining Company

The Tonopah Mining Company is at present the main producer. Three main vein systems are being worked, the Mizpah, the Valley View and the Silver Top, but considerable ore is also coming from No. 1 and 2 Burro veins, which put off, respectively, from the Mizpah and the Valley View veins, as well as from the Mizpah Fault orebody and the two Red Plume veins. The veins are broken by a complicated series of faults, generally of a normal type and with a northerly strike and easterly dip, so that it is impossible to project either a fault or an orebody a greater distance than 25 ft. with any hope of finding it in that position. Along these faults the displacement is generally small, being rarely greater than 50 ft., but it complicates mining a great deal. The property is worked through the Silver Top, Red Plume and Mizpah shafts, most of the ore being hoisted at the latter shaft, as the other three-compartment shaft, the Red Plume, serves the workings where most of the development work is now being done.

The Silver Top shaft is 700 ft. deep. Through it the Silver Top, the Valley View and the Burro No. 1 veins are worked. The deepest level on which the Burro veins are being mined is the 400-ft., but they are also worked on the 200- and 300-ft. levels, where they have been developed for a distance of 1000 ft., although not in continuous ore.

Ore in the Valley View veins has been developed for a distance of 1000 ft.; the width varies from 5 to 30 ft. and the ore is, generally speaking, continuous. In the upper levels the vein dips 30 deg. to the north, but below the 300-ft level, steepens to 45 deg. The ore as mined ranges from $8 to $150 per ton, with a general average between $20 and $25. The Valley View vein passes into the upper rhyolite at depths varying up to 750 ft. as a maximum, according to the contour of the rhyolite surface, and stops at the contact or only a little below it; consequently no ore is mined below the 700-ft. level.

The Silver Top series of veins is much smaller. There are several near the surface but in depth only one. Their widths vary from 2 to 8 ft. The veins have been worked to a depth of 500 ft., but in the extreme eastern part of the ground, beyond the Stone Cabin shaft, where the veins come out of the Jim Butler property, the Silver Top series has not been prospected. About 200 tons per day are being mined from workings served by the Silver Top shaft.

From the Mizpah shaft, only the Mizpah and the Mizpah Fault veins are worked, but an output of 300 to 350 tons of ore per day is made. The Mizpah, which is about 1000 ft. north of the Valley View vein and about parallel to it, is the main vein of the camp, and has produced the greatest quantity of ore. Its extension enabled the Tonopah-Belmont company to continue operations until the ore was found along the Mizpah fault in the Belmont workings, and probably it is the faulted extension that is at present being worked in the Belmont mine beyond the Belmont fault. The ore varies in width from 5 to 30 ft., and assays between $20 and $25 per ton.

The Mizpah Vein

The Mizpah vein has a dip of 70 deg. to the north and is being worked from the surface to a depth of 700 ft. Ore has been followed fairly continuously in depth as well as laterally, but the vein is cut off on the east by the Mizpah fault, and on the west in the upper levels by the Burro fault, which dips away from the Mizpah fault. The 400-ft. level where the ore has been found along a distance of 1400 ft. represents approxi-

mately the average length of ore developed in the vein. On the lower levels the vein is being traced west much farther than the Burro fault, but whether in the deeper workings the vein really feathers out toward the west or is cut off by a fault has not been determined. The ore extends to the rhyolite and there either dies out immediately or does so soon afterward. The depth at which the vein enters the rhyolite varies, but the deepest point is 650 ft. below the surface.

The Mizpah Fault orebody, which is from 2 to 6 ft. wide, has been opened from the 200- to the 500-ft. levels, but it is on the 300-ft. level, where ore has been followed for a distance of 400 ft., that this orebody has been developed the most. This vein, in which the ore has about the same general grade as that of the Mizpah itself, is one of the newer developments, for although the orebody was found about four years ago, its importance has been appreciated only during the last two years; so stoping has not progressed far on it as yet.

In the Red Plume workings two veins, the Red Plume and the North Red Plume have been developed, but little mining has been done on them. Both veins have the easterly strike characteristic of the camp, but the main Red Plume vein dips about 45 deg. to the north, while the north vein is about vertical. The ore in the main vein is from 3 to 10 ft. wide, and in the north vein from 2 to 5 ft. wide. The capping andesite extends to a depth of about 350 ft. in this part of the camp and the rhyolite comes in to end the ore at a depth of 550 to 600 ft. Consequently, these veins have been developed only on the 400-, the 500- and the 600-ft. levels of the Red Plume shaft. It is in this section of the ground that most of the prospective value of the company's ground lies, although in the Sand Grass claim the company is doing some prospecting with diamond drills as the work at the shaft failed to show whether the "lode porphyry" was missing or the upper rhyolite had been faulted into juxtaposition with the capping andesite. As yet no ore has been found in the Sand Grass claim.

All the ore mined at the different shafts of the Tonopah Mining Company is sorted at the surface and from 10 to 12 per cent. is removed as waste. Ore assaying below $10 per ton and as much as $3 or $4 is stored on the fourth-class dump to await a time when milling in the district will be less expensive.

Valuation of Tonopah Mining

Developments in depth in the central part of the property have been negative, and according to the light that has been shed upon the ore occurrence by work throughout the camp, it seems that they will continue to be so, for even if andesite were found at a depth of 800 ft. below the bottom of the Mizpah shaft, there would be little chance of finding ore by sinking under the lower rhyolite and prospecting a new andesite at depth. The mines seem to have prospective possibilities only laterally in the outcrop veins with possibilities at depth in the Sand Grass claims in the western part of the camp. This means that the main ground of the company, the six outcropping claims, has possibilities for ore in those portions of the earlier andesite above the 700-ft. level, which have not as yet been cut by drifting. No doubt much ore will be found by such lateral prospecting, as it is possible to pass quite close to any of these orebodies without finding it, but during the last 10 years the most promising places have been prospected pretty thoroughly.

The Tonopah Mining Company had developed 354,940 tons of ore on Feb. 1, 1911, that averaged $18.61 per ton. This is equal to two years' supply of ore for the mill. The ore reserves, therefore, represent a profit of about $3,017,000, assuming that the cost and the recovery will continue about the same as last year. There is a probability that the cost will be decreased, but not enough to be material.

Subsidiary Assets

The company has in its assets loans amounting to over $500,000, and it also controls the Tonopah & Goldfield Railroad, which is said to have paid for itself the first year it was built. This railroad is 100 miles long, but its present as well as its future value depends upon the mining activity of that part of the State. The value of the railroad is almost as speculative as that of the mine, except that the prosperity of the railroad depends upon the districts, not upon the individual mines. The rest of the company's securities have still more problematic value, so that the value of the securities listed in the company's assets is undeterminable. For instance, the Esmeralda Power Company has a fine plant at Millers, which can be used in emergency in case the power line from Bishop, Cal., should be seriously damaged by a washout, but it cannot compete with the Bishop line in regard to the cost of power. The value, therefore, comes mainly from the protection against the complete shut down that it gives to the mines and mills.

It might be assumed that these securities and cash loans are equivalent to $1.50 per share. In that case, there is left $2 of value unsecured. Consequently, the buyer of Tonopah Mining shares might infer that he is getting a good return on his money, when paying $6.25 per share with 1,000,000 shares outstanding, as the stock is now paying a dividend of about 30 per cent. on its present market quotations, but he should remember that at present only half the value of the shares is represented by developed ore, and that the whole amount, as it is a vanishing asset, must be returned to him before he has any real profit. The mines are 10 years old, and the possibilities have been reduced to lateral developments in the bulk of the company's grounds, so it is time for the investor to put considerably over half his dividends into the amortization of his investment.

The Tonopah-Belmont Mines

Tonopah-Belmont takes second place in regard to developed ore, but the immediate future of this property is the most promising of any in the district. About a year and a half ago there was practically no ore in sight; later, what is thought to be the continuation of the Mizpah vein, was found west of the Belmont fault. The ore was found only after considerable prospecting, but since then a great body of rich ore has been developed that is one of the most continuous in the camp.

In the Desert Queen workings the much faulted Mizpah vein is about mined out, but along the Mizpah fault an irregular occurrence of ore has been found, from 5 to 12 ft. wide, and low in grade. Farther to the south, in the Occidental claim, the company has worked both the South and Occidental veins belonging to the Silver Top. The Occidental vein varies in width from 1 to 3 ft., but the South vein is much stronger and varies between 5 and 10 ft. in width. Both of these veins have been cut on the 800-ft. level about 200 ft. below the cap rock, but as far as they have been prospected neither has been found to carry much ore above that level. Both veins have been stoped for good ore on the 900- and 1000-ft. levels. In the floor of the 1000-ft. level the oreshoot is still 125 ft. long in the Occidental and 150 ft. long in the South vein, but further extension of the ore to the east is limited by the rise of the rhyolite contact. Both veins carry good ore in the andesite, and when only one wall is andesite; but soon after the veins pass entirely into the rhyolite the valuable contents disappear, although both veins still show filling. These veins are still being worked on the 900- and 1000-ft. levels.

In the Desert Queen workings the Mizpah fault vein has also been worked, as well as a small vein called the Middle vein, found in the hanging wall of the Mizpah vein, and between it and the Mizpah Fault vein. Both will probably be prospected further, but the only important orebody now is the new Belmont vein.

To the east in the new ground there is less post-mineral faulting, which makes mining much easier and more profitable. Moreover, while the earlier an-

desite in the Desert Queen workings to the west of the Belmont fault has a thickness of from 200 to 250 ft., in the new ground east of this fault, the andesite has been shown to have a thickness of 375 ft., and there are indications that it will go much deeper.

In these new workings beyond the Belmont fault the vein has been opened on the 900-, 1000-, 1100- and 1166-ft. levels, as well as by a winze to a depth of 222 ft. on the dip below the 1100-ft. level. The earlier andesite comes into the Belmont shaft at a depth of 850 ft., while the vein on the 900 level is not within 500 ft. of the Eula side line, so that there is absolutely no chance for the Rescue-Eula mine to get the apex, unless faulting farther to the east should be found to have thrown the Belmont vein a considerable distance to the south, which is not probable. The Belmont company has close to 1000 ft. to go before the vein will pass out of the property on the east end line, assuming the present strike to continue, as the face of ore on the 1000-ft. level was, on March 1, 1911, about 400 ft. east of the Belmont shaft.

The Belmont Vein

This new orebody in the Belmont differs from others in the camp in that it was formed by the replacement of a fault zone characterized by more complex sheeting than is usual at Tonopah. Consequently, there is much waste rock mixed with the ore, and the vein varies greatly in width, according to how much of the shattered rock has been replaced. The width of the clean ore in a cross-section of the vein averages somewhere between 10 and 18 ft., while the vein itself has a width varying from as low as 10 ft., where the ore is solid between walls, to as great as 40 ft. where the ore occurs in several bands with fingers of unreplaced wall rock between. The ore runs from $25 to $30 per ton for the ore widths given and as yet only on the 1100-ft. level is there any sign that the limits of the orebody are being approached, but on that level the face of the east drift is nearing the point where the capping andesite ought to come in.

On account of the sheeted character of the faulting the walls are not so strong as in other veins of the district and show a tendency to slough off. Consequently, square sets are used in mining the ore. Stringers put off from the main orebody, but generally these return to the vein after a longer or shorter migration in the wall rocks. The likelihood of finding parallel veins in this newer part of the company's ground has not been tested as development has been confined entirely to the main orebody, but the new shaft cut one fairly strong parallel vein.

On March 1, 1911, development had traced the ore a distance of 250 ft. on the 900-ft. level, 650 ft. on the 1000-ft. level, 950 ft. on the 1100-ft. level, and 700 ft. on the 1166-ft. level. This would indicate, after a rough fashion, 235,000 tons of ore with the possibilities of a much larger tonnage. As the profit when the mine is running in good shape, will be at least $16 per ton on the grade of ore in question, it seems quite safe to assume that approximately $3 per share is indicated by this development, and consequently about half the present market value of the shares is represented by ore in the mine. With this showing, these shares, paying 50c. quarterly, look attractive for even if the "lode porphyry" does not extend much deeper, there is every chance that on most of the levels the ore will be traced much farther to the east.

Present Belmont Output

During the present year the orebody should be enlarged by development much more rapidly than in 1910, as during the last 20 months work was greatly hampered by the necessity of tramming 2000 ft. to the Desert Queen shaft. The new shaft is now in operation, but in all probability the new orebody will not be forced until developments determine whether the building of a new mill is warranted. At present the daily production averages about 240 tons of milling ore, assaying from $25 to $30 per ton, and about 50 tons of smelting ore assaying from $50 to $75 per ton.

Further to the east and south the Belmont Extension is preparing to resume work. The shaft is to be sunk to the earlier andesite where prospecting will begin. East of the Tonopah-Belmont, the Mizpah Extension Company is prospecting its ground at a depth of 1000 ft., but has not been able to get out of the rhyolite into andesite. Directly east of the Tonopah-Belmont is the Halifax property, but apparently the owners will wait for ore to be traced closer to them before they spend more money.

The Rescue-Eula company is also preparing to prospect its ground which lies south of the Belmont property. Work is to be done from the shaft and, according to present plans, a diamond-drill hole is to be sunk near the corner of the Eula claim. The Rescue-Eula seems to have a fair chance of finding parallel veins, but there is no chance of the new vein of the Tonopah-Belmont company being found in Eula grounds.

The North Star is also to be reopened to explore the grounds to the east of the Mizpah fault. It will probably be found that the ground is not broken so badly as that to the west of the fault where the company formerly did its prospecting.

The Jim Butler Property

The Jim Butler is the enigma of the camp. Much work was done on the property in the life of the camp, but as little ore was found, the property, except for a little leasing, has been shut down during the last two years. Now prospecting is being resumed on company account. The property has been worked mainly through two shafts, the Stone Cabin, 720 ft. deep, and the Wandering Boy, 620 ft. deep, but some prospecting has been done from minor shafts on the property, such as the Friction No. 1 and No. 2 and the Gold Hill shafts, which last is 800 ft. deep, but the ground has only been prospected on the 500-ft. level, where crosscuts have been driven both north and south in the Gold Hill andesite. Several narrow veins, from 3 to 12 in. wide, have been prospected, and along these small shoots an excellent grade of ore has been found. Often in these shoots there was barren filling 4 or 5 ft. wide alongside the rich streak of ore, but rarely was the good ore more than 12 in. wide.

From the Stone Cabin shaft levels have been driven as deep as 500 ft., but no ore has been mined from below the 400-ft. level. Below that depth the main vein of the Silver Top series feathers out. The South vein, which is producing in the Belmont, was also worked at the Stone Cabin shaft, but not extensively. The ore assayed between $15 and $25 per ton. A number of small parallel veins was found making it necessary to crosscut every 50 ft. to search for these, but no prospecting was done east of the Stone Cabin fault, where the company now proposes to do its work. At the Wandering Boy shaft, only one vein of and strength was found. This produced some high-grade ore and has a width of from 5 to 10 ft. The vein is badly faulted.

In the Jim Butler property, although well situated, there is only a liklihood of finding minor parallel veins, and on account of the considerable amount of prospecting already done, the value of the shares seems extremely speculative.

The Tonopah Extension Company

The main property in the western part of the camp is that of the Tonopah Extension Mining Company, which, since it has acquired the property of the McKane Mining Company, and that of the Red Rock Mining Company, owns the largest area of well-situated ground in the district. The property is equipped with a 30-stamp mill placed near the mine shaft. This is running on about one-quarter dump and three-quarters mine ore and handles about 140 tons per day.

The shaft has only one hoisting compartment, like most of the shafts sunk through the capping, and this greatly hampers the development of the property. The main shaft is 1060 ft. deep. The first level was driven at a depth of 270 ft., the second at 385, the third at 500, the fourth at 600 and the fifth at 700 ft.

The striking thing about the Extension mine is that the vein contains good

ore in the rhyolite and continues quite strong through it to the lower contact, this being the only case where that is true in all Tonopah. The reason for this I have discussed in another article, in which was also given a section of the mine. Practically all the higher grade ore was mined while the old management was forcing dividends out of the mine, so that in most of the workings all that is left is the body of low-grade ore, from 6 to 10 ft. wide, that lies alongside the old stopes, 5 to 6 ft. wide, in which the ore mined averaged about $35 per ton. Sampling has shown that this band of low-grade ore assays approximately $13 per ton. The developed part of the mine is about 800 ft. long as far as ore is concerned. Only in the andesite is the streak of low-grade ore found paralleling the higher grade.

Details of Orebodies

In the block of ore west of the main Extension fault, the rhyolite comes in just above the 500-ft. level, while in the east block the ore is still in andesite on the 600-ft. level. Above the 400-ft. level in the west block and the 500-ft. level in the east block, there are two main veins, one about 3 ft. wide and the other about 12 ft. wide. Below that depth the two branches have united to form a vein 11 to 16 ft. wide that dips about 60 deg. to the north. Upon entering the rhyolite the ore narrows to a width of 3 to 6 ft. and steepens in dip to about 80 deg., but the grade of the ore remains about the same as that of the rich streak in the andesite. In the east fault block the ore is badly leached between the 500- and 600-ft. levels and wherever it has been prospected at that depth it has been found too low grade to be mined. Above the 500-ft. level the ore has the same grade as that in the west block, as it has not been shattered as was the ore below.

In some places the veins have been found untouched, but in most of the mine they have been gouged. On the west end the orebodies are cut off by a fault, the throw of which is considerable, and appears to be at least 400 ft. toward the south, but up to the present development in the new block to the west has not been sufficient to enable the veins to be correlated with those in the other block. It is in this new ground to the south and west in the Grand Trunk claim that the main prospective value in the Extension has been indicated, for on the 400-ft. level in this ground three new veins have been cut from 3 to 4 ft. wide, in two of which the ore is of commercial value.

On the 400-ft. level the company is prospecting the contact between the upper rhyolite and the earlier andesite, which the MacNamara and the West End are stoping. At this point there is a body of ore from 4 to 10 ft. wide, assaying from $10 to $11 per ton. This contact, in the Extension ground, carries fair ore wherever it has been broken by faulting or cross fractures and the Extension company fortunately has a large area of this contact. The lower contact is also silicified and mineralized so that now that ore has been found in the MacNamara mine along the lower contact of the upper rhyolite with the calcite-andesite, the Extension company is also planning to try out this contact in its ground. But these two contacts do not seem to have so much prospective value as the long stretch of ground to the west, in line with the main vein system of the camp.

The company is mining about 4000 tons per month, and is making at present, on an ore that averages only $13 per ton, a monthly profit of $20,000, showing most efficient management. There is not much ore developed in the mine. Still there is enough in sight to pay the bond issue of about $188,000, put out to enable the mill to be built, and which must be wiped out before the mine can pay a single dividend, while in many places considerable new ore is appearing. Consequently, as an out-and-out speculation the Tonopah Extension shares at their present price of $1 are interesting.

Other Contact Deposits

The next mines are the two that are working the contact between the upper rhyolite and the overlying earlier andesite. This contact carries a primary, low-grade mineralization wherever the earlier feeding fissures permitted the solution to get into the contact. Apparently the condition on the contact during the passage of these primary solutions was not favorable to precipitation of the silver minerals, for although there is a thick deposit of silica, the grade of the filling is very low. Later solutions that traveled along the contact had a strong corrosive action on the ore minerals and leached much of the silver and gold out of the quartz along the contact. Finally, these solutions reached more open courses formed by fracturing subsequent to the primary mineralization of the contact and precipitated or reprecipitated the precious-metal burden in these broken-up places, just as these later solutions concentrated the precious metals in streaks and shoots in the fissure veins of the Tonopah-Extension mine nearby.

MacNamara

The MacNamara contact has been folded into a decided anticline. There are several faults cutting across the property without any fixed direction but seemingly showing a tendency to radiate from Mount Brougher. The displacement on these is generally only 1 to 15 ft., but there are two main faults, the MacNamara-Extension fault, which has a vertical displacement of 50 to 60 ft. and a lateral displacement of 120 ft., and the Buckboard fault which has a drop of 50 ft. In the MacNamara mine the foot wall is generally quite good, and the ore apparently makes into stopes only where fracturing has allowed it to eat up into the hanging wall. The best and largest stopes seem to be in the flatter parts of the contact. The general slope of the contact is about 25 deg. to the north or to the south, according to the side of the anticline.

Above the 200-ft. level the contact forms a terminal edge where it is cut off by the andesite. This is partly in MacNamara ground and partly in West End ground. The ore varies in width from 1 to 15 ft. in typical stopes, but in places the ore has been found in large areas of a thickness of 40 ft. Some stopes are extensive and one of them produced over $300,000 of ore. Stoping is going on along the upper contact from the 300- and the 375-ft. levels, as well as from the intermediates between them, while on the 800-ft. level the lower contact is being prospected. Some ore has been found along the lower contact but not much. This has been of good grade and showed gold and silver in about equal value. What ore has been found occurs in a broken-up area, as is the case along the upper contact, so that there seems to be a strong possibility that good ore will be found along the lower contact in the broken areas under where ore is found on the upper contact. The mine is producing only on a small scale at present. The ore assays from $25 to $30 per ton as sent to the smeltery, and from 750 to 1000 tons of ore are shipped per month. Unfortunately the MacNamara company owns only a small area.

West End

At the West End only the upper contact is being mined, but it is the intention of the company to sink to the lower contact and prospect that part of its property. Mining is going on mainly west of the main shaft and on the 300- and 400-ft. levels. This ore along the contact is being mined in a series of stopes, with low-grade areas between, for a distance of 500 to 600 ft. The ore as mined varies in width from 6 to 9 ft., but in places is 25 ft. wide.

Generally there is a streak along the foot of the vein much richer than the average ore. A station was being cut on the 500-ft. level at the time of my visit in December and prospecting on that level was expected to begin soon. The company is also driving to the Ohio property on the 300-ft. level, so as to catch the contact in the Ohio part of the ground owned by the West End where it passes beyond the MacNamara endline. At present about 1500 to 1800 tons of ore per month are being shipped to the smeltery and this ore averaged during the last year $22 per ton.

The West End has a large area of ground, and it is area that counts in these contact deposits. The company is preparing to push the mine more vigorously than in the past and the property appears to have a good future. In December a vein 4½ ft. wide, carrying high-grade ore was cut in the West End of the 400-ft. level, in the earlier andesite, adding considerably to the possibilities of the property. The value of the property is mainly speculative as ore can not be kept developed much ahead of mining in these contact deposits.

The Montana-Tonopah company is working mainly in the southern part of its property on a minor series of veins. The company resumed the payment of dividends about six months ago, but the future of the property is not alluring as the main sulphide veins have been worked out as far as they can be traced, and the prospecting that the company has done to the north, where most of its ground lies, has been negative in its results. Moreover, the veins that are being worked are much broken up by complicated faulting so that their mining is expensive. The mine is well operated and is producing about 150 tons per day for the 40-stamp mill. This tonnage the property will probably keep up for some time to come, as the veins are yet far from being worked out, but the future of the mine is unpromising.

The Tonopah-Midway property is producing a small tonnage of ore as the main veins of sulphide ore are about worked out as far as they can be traced at present. The company has leased the Golden Anchor shaft for a period of three years and plans to prospect its northern and western ground at depth from that shaft, as some ore has been found along a contact in that part of the ground. The property is shipping about 50 tons of ore per week, that varies in assay from $25 to $90 per ton according to the part of the mine from which the ore is taken.

Tennessee Copper Costs

The cost of producing copper at the Tennessee Copper Company's smeltery, at Copperhill, Tenn., is given in the annual report as 9.52c. per lb., f.o.b. cars at Copperhill.

COST OF COPPER AT SMELTERY

Item	Cost per ton of ore	Cost per lb. of copper
Mine development	$0.211	$0.0072
Mining ore	0.968	0.0330
Smelting	1.227	0.0419
Converting	0.156	0.0053
Railway	0.068	0.0023
Engineering	0.052	0.0018
General expense	0.108	0.0037
	$2.790	$0.0952

This is on a recovery of 29.3 lb. of copper per ton of ore, and a tonnage of 405,463 mined. The cost of copper delivered to consumer was $0.1064 per lb. of fine copper, the difference being represented by freight, refining, selling, N. Y. office, legal and other overhead charges.

The de Jonge Concession in Dutch Guiana

By J. B. Percival*

About 75 miles inland and a little to the southeast from Paramaribo, the capital of Dutch Guiana, lies the rich de Jonge concession. On this property is a range of mountains about 300 ft. high, where is situated the mine proper, in many respects unusual, whether considered from the point of view of its discovery, its richness or its geological formation. Its discovery is a typical instance of mining luck. As early as 1883 the district nearer the coast was thought to be gold bearing, and from one of the rushes that took place, several villages sprang into existence, though no discoveries of permanent value were made at that time.

In 1907 an Englishman who was investigating the mineral possibilities of the district, made the acquaintance of an old negro, who said that one day while hunting for deer, he had picked up a piece of blackish rock which on examination showed bright specks, and when held in the sun's rays had a brilliant color. The Englishman was interested in the old man's story, and inquired if he thought he could find the spot where he made the discovery. The old man willingly offered to take him to the spot.

The two after traveling 10 miles reached the top of a range of hills, then crossed a deep gully, in which the Englishman noticed a large black boulder. He knocked off a piece of this. The gully and the slopes around it at this point were strewn with similar boulders, and from many of these he also took specimens. They then mounted one of the highest spurs on the top of the mountain, 300 ft. high, and found the top of this spur strewn with boulders of similar appearance. These were examined, and from some of them specimens were also secured. They then returned to camp and went down to a creek and "dollied" out some of the specimens. To the Englishman's intense astonishment he found that in some of the fragments there was almost as much gold as dirt. In order to obtain an accurate verification of his own rough assay, he sent some specimens to Swansea, which yielded exceedingly high returns. The next step was to apply to the government for a concession to mine and to begin operations.

A company was formed for a large amount out of which the old negro received for his information £1000, for which he was truly happy. There is probably £1,200,000 worth of ore in sight. The mountain is not only a marvel in its richness, but the origin of the gold is as yet an unsolved problem. Prior to the working of the hill, if the ordinary miner had ventured to assert that the dark brown stone, clearly of pyritic formation, contained payable gold he would have been laughed at. All the settlers in the neighborhood had been for years familiar with the existence of these strange surface boulders which they took for iron, the peak being known as Iron mountain.

Although neighboring hills are almost of the same formation, none of them has yet been found to contain payable gold. Thousands of pounds have been spent in minute explorations of the adjoining country. Only isolated traces of precious metal have been found in rock formations identical in color, form, and composition with that of Iron mountain in all but one particular: they do not contain gold.

The most widely accepted theory of the origin of the deposit in that of Robert James, late geologist of New Zealand. His explanation is that a thermal spring, such as the geysers of New Zealand and Iceland, was the principal factor in the formation of these gold deposits. This with volcanic action, seems to account for all the phenomena. Everything is being done to push the work and uptodate machinery will be installed. The government railroad passes through the property, communication and transportation are quick and inexpensive; and last but not least the climate is salubrious.

*Paramaribo. Surinam, Dutch Guiana, S. A.

Carn Brea and Tincroft Mines

London Correspondence

The head of the firm of Harvey & Co., Frank Harvey, has resigned his position as chairman of the board of directors, but has not stated his reasons. Mr. Harvey is also chairman of the Dolcoath board of directors. Cornwall can ill afford to lose the services of such a shareholder as he has been prominently connected with Carn Brea for more than 25 years, and the firm which he represents for nearly 100 years. Harvey & Co. were at one time the principal makers of mining machinery, but today they are better known as a distributing or trading firm. A new manager has recently been appointed, as the old manager, the late Captain Penhall was a nominee of the Harvey & Co., interests. The new manager, E. S. King. has been appointed from a list of over 20 applicants at a salary of £1000 per year. Mr. King's experience in tin mining and metallurgy has been largely Australian, and this is no doubt the first time in the history of Cornish mining, that anyone but a Cornishman has had the management of a Cornish mine, although Cornishmen have had charge of mines in every part of the world. The mines for the month of May treated about 12,000 tons of tin ore of an average tenor of over 26 lb. of tin per ton, and calculating black tin at 25c. per lb., there should be a profit.

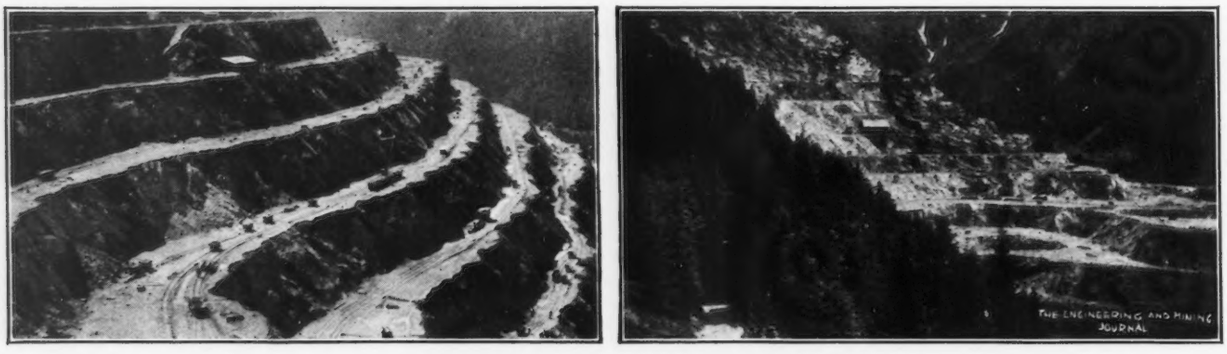
The Erzberg in Styria

By Joseph T. Singewald, Jr.

A bedded iron-ore deposit in the eastern Alps is worked on surface in a series of 50 terraces from 35 to 50 ft. high. Machine drills and steam shovels are superseding hand drilling and hand loading of tram cars.

The central portion of the eastern Alps consists chiefly of granite, schists and gneisses. Bordering these rocks on both the north side and the south side, are the *Kalkalpen,* consisting chiefly of Triassic formations. Between the central crystalline and the bordering Triassic rocks, is an extensive complex which grades from schists in its lower portion into shales, chlorite and talcose schists, graywackes, limestones, and dolomites in its upper portion. This complex was formerly called the "graywacke zone," its real stratigraphic position being unknown. Subsequent discoveries of fossils showed that it includes Paleozoic rocks of Silurian to Permian age.

In the northern Alps, this complex extends as a narrow band, more or less continuous, for a distance of over 200 miles in an approximately east and west direction. This zone is characterized throughout its extent in the northern Alps by the presence of bedded deposits of siderite, which have been worked at many points. These deposits attain by far their greatest development on the Erzberg at Eisenerz in Styria.



VIEWS OF THE TERRACE ON THE ERZBERG IRON MINE

SITUATION AND HISTORY

Surrounded by massive mountains, the Erzberg rises as an almost isolated peak above the inclosing valleys to a hight of 1357 meters. The mountain lies just south of the town of Eisenerz and about ten miles northwest of Leoben, the seat of the Austrian mining school.

Mining operations date back to Roman times, and it is probable that ore was mined still earlier by the original inhabitants of the country. After remaining idle for some time, mining was resumed during the Middle Ages and has continued to the present day. The early mining was confined to the weathered portions of the deposit, where the siderite had been converted into limonite. Even after the siderite began to be mined, the production did not reach its present proportions until in recent years. By 1891, the output exceeded 600,000 tons; and has since then continually increased, until now it has reached 1,700,000 tons annually.

The general geological features of this region have been briefly indicated; the two profiles herein given show more detail of the geology in the immediate vicinity of the ore deposit.

The basement rock in the neighborhood of Eisenerz is always the so called Eisenerzer graywacke. This was formerly looked upon as a normal member of the graywacke zone; but it is now recognized as a portion of the crystalline rocks of the central Alpine area, of which it forms the youngest member, and is called the Blasseneck gneiss.

Unconformably overlying the Blasseneck gneiss, on Reichenstein, the mountain to the south of the Erzberg, are quartz phyllites of Silurian age frequently impregnated with pyrite. Above these phyllites are 600 to 700 meters of Upper Silurian limestone. Entirely independent of these Silurian ores, there occurs on the Erzberg as lowermost member, unconformably overlying the Blasseneck gneiss, an alternating series of limestone and ankerite called the Sauberg limestones. The ankerite layers are known as *rohwande,* and pass over in a most irregular manner into pure siderite. Fossils found in this series show it to be of lower Devonian age.

SIDERITE ORE BED LACKING IN FOSSILS

Unconformably overlying the Sauberg limestones, is the main ore bed, at the base of which is a layer of dark sericitic schist of variable thickness called the boundary schist. This main ore bed is thick, well stratified siderite, in which fossils are wholly lacking, making it impossible to determine its exact age. As it is overlain unconformably by the Werfener shales, which are the lowest member of the Triassic, its age is definitely fixed as Paleozoic. Vacek, who lays great stress on the unconformity between the Sauberg limestones and the iron ore formation, regards the latter as probably of Permian age. Others, who do not attach any great stratigraphic significance to the so called boundary schist, regard the entire series as Lower Devonian age.

The Triassic begins with a conglomerate or breccia formation made of material from the Sauberg limestones or the main ore bed. Above this comes a layer of grayish-green sandstone which gradually passes into the normal red Werfener schists. These beds, overlying the main ore bed unconformably, are the youngest rocks on the Erzberg. Following these, on Pfaffenstein to the north, are the younger members of the Triassic series.

The section, Fig. 1, shows the tectonic relations of the formations occurring on the Erzberg. The beds of the Sauberg limestone near the foot of the mountain, which are in contact with the Blasseneck gneiss, belong to a higher horizon than those in contact with the gneiss at the summit of the mountain. This relationship can be explained either by assuming the surface of the gneiss to have had the form of a trough with its deepest portion to the south of the present Erzberg and the Sauberg limestones to have been deposited in that trough with a gradual northward transgression during deposition, or by assuming an overthrust fault. As there is no evidence for the latter assumption, the former explanation probably is more correct. After deposition, the Sauberg limestones were tilted toward the

north and eroded, and on their eroded surface the main ore bed was laid down. Upon this complex a synclinal structure was subsequently superimposed of which the trough and a part of the southern limb forms the northern slope of the Erzberg. The faults in the trough of the syncline were no doubt formed at the time when this folding took place.

Ore Occurrence

The siderite of the main ore bed possesses a fine-grained uniform structure and is known to the miners as *flinze*. It is only along fissures and crevices, where redeposition has taken place, that it assumes a coarse-grained, spathic texture. Besides this coarser siderite along fissures, the only other interruption to the general uniform character of the bed is that caused by small intercalations of barren shale and limestone.

Unlike the main ore bed, the ankerite and siderite in the Sauberg limestone are irregularly distributed. The irregular masses of ankerite, or *rohwande*, grade from pure limestone to workable masses of siderite occurring in nests or pockets. Pyrite, arsenopyrite, chalcopyrite, and cinnabar are present, but in such minute quantities that the ores are remarkable for their purity. The iron content averages 39 per cent., roasting raises it to about 50 per cent. The manganese content of the roasted ores averages about 3 and the phosphorus 0.03 per cent.

The main ore layer attains a maximum thickness of 125 m., but averages about 60 m., and has been followed for more than 1000 m. along the strike. The ore reserve on this mountain is estimated at over 200,000,000 tons. The deposit is of great mineralogical interest on account of the magnificent aragonite crystals it contains. Aragonite is found well banded, and compact in fissures and as "flos ferri" in the larger fissures and cavities. The unusual beauty of the development of the "flos ferri" has given the region its mineralogical fame.

Origin of the Ore

The syngenetic nature of the ore was not doubted, and until a few years ago the deposit was generally regarded as of sedimentary origin. The iron carbonate was supposed to have been precipitated together with the calcium carbonate and, according to the amount of iron precipitated, either ore, *rohwande* or limestone was formed. Within the last seven or eight years some geologists have been inclined to regard the deposit as a metasomatic replacement of limestone. They point especially to the irregular distribution of the siderite in the Sauberg limestones as evidence of replacement. Also the presence of sulphides in the ore, though in small quantity, has strengthened this view, since similar occurrences of siderite with somewhat greater quantities of sulphides in other parts of the eastern Alps seem to be metasomatic replacements.

Against the theory of an epigenetic origin for this deposit, the advocates of the sedimentary theory have advanced several arguments. They maintain that the small quantity of sulphides present may be due to secondary impregnation, and certainly are not present in sufficient quantity to attach to them any great genetic significance. The marked, well developed bedding of the main orebody does not indicate metasomatic formation. If the iron carbonate in the Sauberg limestones is due to a replacement of the limestone, it is not difficult to conceive of the easily soluble iron carbonate of the overlying orebody having penetrated into these limestones and effected their partial replacement. Then too, if the deposit is of epigenetic origin, the substitution must have taken place in Paleozoic time, as the conglomerate at the base of the Triassic contains fragments of the ore. Hence the most probable view in regard to the origin of these deposits, is that the main ore bed is of sedimentary origin, and that the iron carbonate in the underlying Sauberg limestones is a replacement product formed by ferriferous solutions derived from the overlying ore.

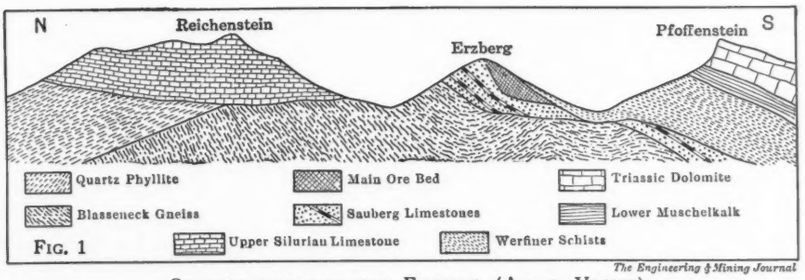


FIG. 1 SECTION THROUGH THE ERZBERG (AFTER VACEK)

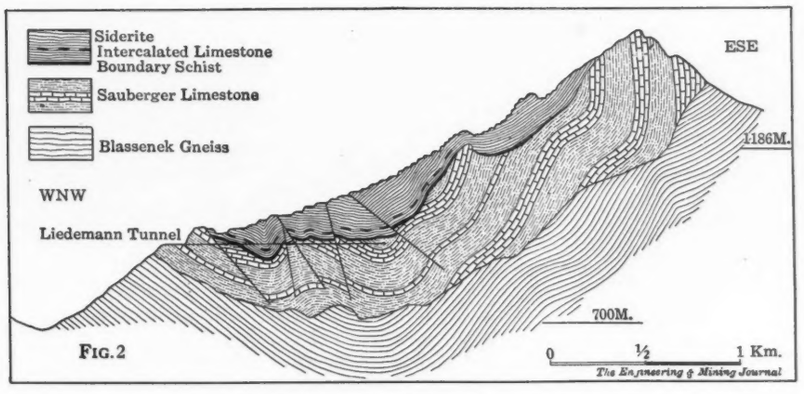


FIG. 2 SECTION OF THE ERZBERG SIDERITE BED

Mining

A number of favorable circumstances combine to make the Erzberg by far the largest and most important iron-ore deposit in Austria, among which are the great size of the deposit, the purity of the ore, and, as important as any other factor, its topographic position, which makes possible a remarkably simple and easy large scale method of mining.

Since 1666, the mountain has been divided into two fields, one of which includes that portion above an elevation of 1186 m. which is known as the Wordernberger field, and the other that portion below 1186 m. which is known as the Innenberger field. The Innenberger mines were united to form the Innenberger Gewerkschaft, and this in 1881 became the Alpine Montangesellschaft which company owns the mines at present. Since 1890, the Alpine Montangesellschaft has also operated the Innenberger field in which it holds a two-sevenths interest. At this same time, the Eisenerz-Leoben railroad, which was built to facilitate the transportation of the ore, was completed. This runs from Eisenerz to Leoben across the Erzberg, and is in part a cog-wheel road.

Before the consolidation was effected much of the mining was underground. This has since then been abandoned, and a system of quarrying undertaken, which embraces the entire north and west side of the mountain over an elevation of 600 m. The mountain slope has been laid out into 50 terraces at intervals of from 10 to 15 m. The accompanying halftones are views of some of the terraces on the northern slope. Mining is carried on simultaneously on all the terraces, by quarrying into the face of the ore above each terrace floor. Blasting is done three times per day on all 50 terraces at once; and, viewed from the

Barbara House to the east of the terraces, is a most magnificent sight. In fact so impressive are the operations that the mountain is visited by many tourists.

Each terrace is provided with tram tracks by which the ore is run to shafts leading to the main levels, and the waste carried to an enormous dump which is on the west side of the mountain south of the ore beds. The ore above the 1274-m. terrace is transported by a narrow-gage line on that level to the Präbühel station on the Eisenerz-Leoben railroad. The ore below that level is transported in part on the 1070-m. terrace to the Erzberg station on the same railroad, and in part through the Liedemann tunnel to an inclined railway on which it is brought to the roasting ovens at Eisenerz. The total length of track on the mountain is far in excess of 100 kilometers.

During the last year about 1,700,000 tons of ore were mined, and 1,200,000 tons of waste carried to the dump. To blast this rock required 100 tons of dynamite. Every effort is being made to do this work as far as possible by means of mechanical power. Machine drills are gradually being introduced to do away with the old method of drilling the blast holes by hand; and, at the time of my visit, experiments were being made with a steam shovel for loading the ore into the tram cars. The results were satisfactory to the engineers in charge of the operations, so that the introduction of the steam shovels is assured. From 3000 to 4000 are miners employed, who are paid about $1 per day in summer and 80c. per day in winter. The greater part of the output goes to the company's furnaces at Eisenerz, Hieflau and Donawitz. A large quantity goes to Germany, especially to Upper Silesia; and smaller quantities to Bohemia and Moravia.

Buffalo Mines, Ltd.

The report of the Buffalo Mines, Ltd., operating in the Cobalt district of Ontario, Canada, for the year ended April 30, 1911, shows a total extraction of 1,540,783 oz. of silver. Costs were: Mining, 8.97c. per oz.; milling, 4.12c.; cyaniding, 2.37c.; installation and repairs, 1.84c.; depreciation, 2.06c.; boarding house, 0.49c.; transportation and treatment, 4.94c.; general expenses, 2.42c.; total, 27.21c. per ounce.

Dividends of $370,000 (37 per cent.) were paid and $41,419.50 carried forward to surplus for the year.

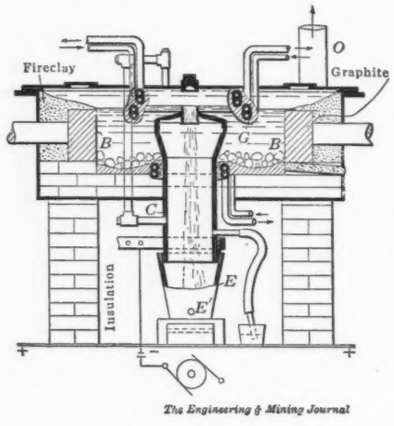
The following development work was done: Raises and winzes, 117 ft.; station cutting, 54 ft.; drifting, 1412 ft.; stoping, 52,321 cu.ft. There were 36,750 tons of milling ore broken, of which 33,705 were hoisted, and 3045 left in the mine. From the stock piles on the surface were taken 7779 tons, making a total of 41,484 tons sent to the mill.

The mill heads averaged 36.07 oz. silver per ton and the concentrates 1031 oz. The slime from the concentrator was treated by the cyanide plant, at which the heads averaged 13.06 oz. per ton and a 67.62 per cent. extraction was made. The total recovery in both mill and cyanide plant was 86.98 per cent.

Ore reserves are said to have been increased by 36,000 tons, equivalent to 1,118,000 oz. during the fiscal year. Additions are being made to the cyanide plant, which will enable 100 to 115 tons per day to be treated. Difficulty has been experienced both with the Cobalt Power Company and the Cobalt Hydraulic Power Company, due to shortage of compressed air, which has interfered with development work, but it is hoped that these troubles are now over.

Manufacture of Sodium

The only two companies manufacturing sodium in the United States in 1910, were the Virginia Electrolytic Company and the Niagara Electrochemical Company,



SODIUM FURNACE

the former using a process of its own for obtaining sodium and chlorine by the direct electrolysis of molten chloride of sodium. The Niagara company uses the well known Castner process, in which molten caustic soda is the electrolyte. The production last year amounted to about 2000 tons, the output being practically the same as in 1909. The value of the product is about 25c. per pound.

The accompanying illustration shows a cross-section of the circular furnace used by the Virginia Electrolytic Company, at Holcomb's Rock, Va. *B B* is an annular graphite anode, and *C* the iron cathode; the cooled curtain within which the sodium collects on top of the electrolyte is shown at *G*, and the molten sodium overflows through the lip in the top of the cathode into the iron receptacle *E*. The sodium remains molten in the receptacle and is tapped from time to time through the tap holes *E'* into large ladles containing a little paraffin, which melts and floats on top of the sodium, protecting it from the oxidizing action of the air. From the large ladles the sodium is poured into molds and shipped as pigs of sodium in tin-lined steel drums. The chlorine gas, which is separated at the anode, is withdrawn through the pipe *O* and utilized in the manufacture of chlorine compounds. The largest furnace so far constructed consumed a current of 10,000 amp. It has been found that the process works best with large furnaces.

Vanadium Poisoning

Vanadiumism is a chronic intoxication caused by injection or absorption of some forms of vanadium, either industrially, medicinally or accidentally. W. F. Dutton, M. D., in the *Journal* of the American Medical Association, states that the principal lesions are found in the lungs, kidneys and gastro-intestinal tract. The lungs are highly congested; the kidneys reveal congestion due to continuous irritation; the gastro-intestinal tract shows evidence of irritation and inflammation.

Persons employed in establishments where the various salts of vanadium are produced, and more especially vanadium trioxide, suffer from chronic poisoning; laborers in reduction plants, who are exposed to the dust and fumes, are most susceptible. Accidental poisoning may come from using or wearing clothing dyed by vanadium chloride, trioxide or pentoxide.

Anemia is an early symptom of vanadium poisoning. There is also a cough that is prominent and characteristic; it is dry, irritating and paroxysmal, becoming so intense that hemorrhages are frequent and severe, even causing death. The workers in the manufacture of the various products of vanadium are very susceptible to tuberculosis and, unless removed from the labor, rapidly succumb to the disease. Emaciation, irritation of the nose, eyes and throat are always in evidence. Nausea and diarrhea (often absent), followed by obstinate constipation, indicate gastro-intestinal involvement. Continuous exposure to the poison leads to fine tremors of the extremities, headache, neuroretinitis, amaurosis, vertigo, hysteria and melancholia.

The prevention of vanadiumism is difficult in vanadium works, owing to the carelessness of the employees and employers. Means to allay and carry off the dust and fumes should be employed constantly. Perfect ventilation and the use of respirators are imperative. The treatment of poison cases should be placed in the hands of competent physicians. As an aid in recovery, active outdoor exercises are essential, while Turkish, Russian or cabinet baths may be given to aid in the elimination of the poison.

Coal Mining Department

The Important News Of Coal Mining. New Appliances, New Methods, New Fields, Colliery Engineering

The Escape of Gas from Coal

A paper dealing with the "Escape of Gas from Coal" has just been issued by the Bureau of Mines. The authors, H. C. Porter and F. K. Ovitz, in their general statement say: "It is a matter of common knowledge that inflammable gas, made up chiefly of methane, which forms with air the so called firedamp of the miner, escapes from the coal in many mines; yet little is known as to the condition of this gas in the coal, its quantity and rate of escape. In addition to the gas set free by the coal itself, there is in many mines a large amount of inflammable gas that comes from reservoirs in the rock strata above or below the coal bed and enters the mine through cracks in the roof or floor. Gas entering the mine in such manner from extraneous sources is not considered in the following report, which presents rather some results of a laboratory investigation of the rate of escape of gas from several coals while kept in bottles connected to gas-collecting reservoirs.

"The results of the investigation show that gas escapes from coal not only during the breaking down of the coal in the mines, but also continuously for a long time after the coal is mined. The volume from some coals is so great as to merit serious consideration in connection with the ventilating of the mines and the choice of methods of breaking down the coal. For example, during the first two weeks after mining, there was set free by one coal, exclusive of the gas that escaped during mining, a volume of methane equal to three-fourths of the volume of the coal itself. Probably each cubic foot of this coal (in the seam) set free in all, during the mining and during the first two weeks thereafter, a cubic foot of methane. It was shown by test that during the first five months after mining, there was set free from this coal a volume of methane equal to one and three-fourth times the volume of the coal.

"Many investigators, Chamberlin, among others, have shown that methane accumulates along lines of fracture, such as joint cracks, or in places of increased porosity in the coal bed and escapes from these as they are cut in mining. In any locality of the mine where, for any reason, adequate ventilation is not maintained, the methane which has thus escaped may become a source of danger from explosion.

"The results of the experiments discussed in this paper show that certain American coals, whose mining is attended with danger from accumulations of inflammable gas, liberate this gas not only while they are being broken down in mining, but also during a long period thereafter. At first the gas escapes rapidly, but the rate diminishes and tends toward a final cessation in three to eighteen months. If the volume of the small lumps of coal used in the experiments be taken as the unit of measurement, about one-fourth volume of methane escapes during the crushing of the coal, as shown by Chamberlin, and one-half to one and one-half volumes on continued exposure to the air, as shown by ourselves. The loss of fuel value by this loss of gas is small, but the danger of accumulation of explosive gas from this source in mines and in coal bunkers is sufficient to justify its being taken into account in the ventilation of mines and in the storage of coal."

Mine Cave Fatality

Antoinette Carbalotto, seven years old, was swallowed up by a mine cave on a knoll over the Jermyn No. 1 mine workings in Snyder's Patch, Old Forge, Penn., on Thursday afternoon, June 15.

This accident is unique and is one of the most pathetic in the history of mine cave settlings in the anthracite regions. The knoll on which the little girl, who lost her life, and her companions were playing is of considerable elevation. It was used as a recreation ground or playground for the little ones residing in the Patch. A man named Antonio Trotte passed by the knoll during the afternoon and noticed a number of fissures which are the first indications of a surface subsidence. He warned the children off the knoll and they proceeded to obey him. As they were doing this the knoll was riven as if by an earthquake and Antoinette was swallowed up before the eyes of her little playmates and Trotte. She was the youngest of the children and was more tardy than the others in leaving the spot. Had the 10 or 12 other children who were with Antoinette not acted so responsively to Trotte's warning, probably every one of them would have met a similar fate.

After the girl had disappeared, John Corcoran, the colliery superintendent, got together a gang of 50 men with excavation tools in the feeble hope that they might be able to rescue the child alive, or at least to excavate the remains as quickly as possible, but it was a much more difficult job than Corcoran and his men anticipated at the outset. The men who attacked the cave-in from the inside of the mine were forced to abandon the work, owing to the roof falls that were occurring around them. The outside men had to proceed with great caution, lest they might be engulfed themselves.

The remains of the little girl were found on Friday evening and taken to the surface. The death of the child caused intense excitement among the Italian miners living in the Patch.

Cost of Handling Lake Coal

Statistics collected for the Interstate Commerce Commission give the cost of hauling coal to the Lake ports from West Virginia and the Pittsburg district on all the roads engaged in the business. Two sets of costs are given, one including the actual train movement only, the other maintenance and all general expenses. From the West Virginia district a further computation includes also the cost of returning empty cars to the mines. The West Virginia costs are given in the following table, for six lines, in cents per ton-mile:

	Train Costs		All Costs	
	Loaded	Loaded and Empty	Loaded	Loaded and Empty
Penna. Co.	0.0603	0.1095	0.1335	0.2424
Kan. & Mich.	0.0407	0.1250	0.1320	0.2374
Hocking Valley	0.0524	0.0960	0.1081	0.1986
Ches. & Ohio.	0.0458	0.0868	0.0898	0.1705
Balt. & Ohio.	0.0589	0.1009	0.1262	0.2044
N. & W.	0.0438	0.0818	0.0799	0.1491

The costs include switching at docks and at the mines. The costs on four roads carrying coal from the Pittsburg district are given below, these including only the cost of hauling the loaded cars; the figures, as above, are in cents per ton-mile:

	Train Costs	All Costs
Pitts. & Lake Erie	0.0413	0.1242
Lake Shore	0.0476	0.1181
Penna. Co.	0.0578	0.1279
Balt. & Ohio	0.0695	0.1418

The rate on West Virginia coal to Lake Erie ports for shipment varies from 96¾c. from the Fairmont district to $1.12 from the Pocahontas region. The rate from the Pittsburg district is 88c., and the Pittsburg shippers are asking for a reduction on the ground of discrimination. They claim that while the rate from the Pittsburg district averages 0.652c. per ton-mile, that on Fairmont coal is only 0.410c., and on Pocahontas 0.320c. per ton-mile.

Chamber Pillars in Anthracite Mines

By Douglas Bunting *

A discussion of methods and formulas whereby the size of pillars necessary to support any prescribed depth of overlying strata can be determined.

NOTE—Paper presented at the Wilkes-Barre meeting of the American Institute of Mining Engineers, June, 1911.

*Chief engineer, Lehigh & Wilkes-Barre Coal Company, Wilkes-Barre, Penn.

With the gradual exhaustion of the upper veins in the anthracite coalfields, the problem of mining at greater depths acquires increasing importance and demands the consideration of a number of important factors, one of which is the greater earth pressure and the consequent necessity of stronger support for the roof.

Under the pillar-and-chamber system, almost exclusively followed in the northern anthracite field, the highest economy in mining is generally secured by leaving, on first mining, pillars only sufficient to support safely the overlying strata. As to the necessary size of such pillars, the opinions of mining experts are widely divergent. In establishing the width of chambers and pillars, the thickness of vein and its depth below the surface have received little consideration. For instance, it has been quite usual to work both overlying and underlying veins with the same width of chambers and pillars, when the lower vein was two and one-half times as thick, and twice as far below the surface, as the upper. In view of the generally accepted theory that the crushing strength of coal pillars of the same base area becomes less with increased hight, it is probable, in this instance at least, that the most economical mining has not been secured.

This question of adequate pillar support is economically less important down to about 800 ft. than at greater depths; and it is with reference to mining at these greater depths that the study of the subject here presented has been prompted.

The necessity of leaving larger pillars, involving greater mining costs per ton and also smaller yields per acre, is one of the troubles of deep working. To mine without leaving adequate pillar supports will result, sooner or later, in a squeeze. Limited areas, it is true, have been mined at certain widths of chambers and pillars, without caving or squeezing; but this is not positive proof that such pillars would be of sufficient size, under the same conditions of thickness of vein and depths below the surface, for larger areas; for frequently a squeeze will not be induced until a large area has been mined. That considerable portions of our coal deposits have been abandoned, temporarily or permanently, on account of caves and squeezes, is apparent to every observer. The primary cause of a squeeze is insufficient support; the secondary causes are the desire for large immediate output; the lack of systematic mining; and the disturbance of the strata due to some other squeeze or cave. The primary cause, as its possible avoidance, will be considered later. Of the secondary causes it is unnecessary to discuss at this time, the desire for large output and the lack of systematic mining.

Effects of a Squeeze

The production of a squeeze by the disturbance of the strata caused by another squeeze, in an overlying or underlying vein, is a very common occurrence, the results of which are frequently as serious as those of the original movement. Workings which, otherwise, would have safely withstood the pressure due to their depth below the surface may be thus disastrously affected. The inherent effects of a squeeze are the crushing of the pillars, the caving of the roof, and the heaving or lowering of the bottom. These occur in various degrees and combinations; but usually the crushing of the pillars is followed by a breaking and caving of the top, which will usually arrest the lateral extension of the squeeze. The area of crushing apparently depends upon the nature and size of the coal pillars, as well as the nature of the roof. The indirect and general effects of a squeeze include possible loss of life; surface disturbance, with consequent damage to buildings and other surface improvements; the liberation of gas and water into the mine; the caving of gangways and airways; and the necessary suspension of mining in sections of the mine directly affected, and frequently in those contiguous thereto. It need hardly be added that these results, though variable in importance according to local conditions, all add to the costs of mining.

It will doubtless be possible to re-

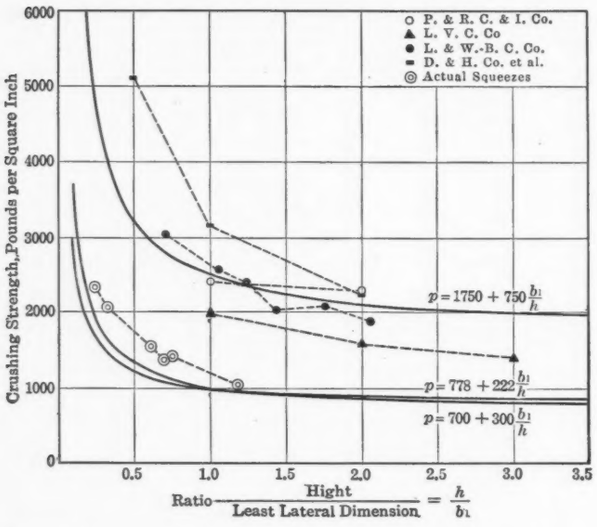

P. & R. C. & I. Co.
L. V. C. Co
L. & W.-B. C. Co.
D. & H. Co. et al.
Actual Squeezes
Crushing Strength, Pounds per Square Inch
$p = 1750 + 750\frac{b_1}{h}$
$p = 778 + 222\frac{b_1}{h}$
$p = 700 + 300\frac{b_1}{h}$
Ratio Hight / Least Lateral Dimension $= \frac{h}{b_1}$

FIG. 1. RELATION BETWEEN THE CRUSHING STRENGTH AND THE RATIO OF HIGHT TO LEAST LATERAL DIMENSION

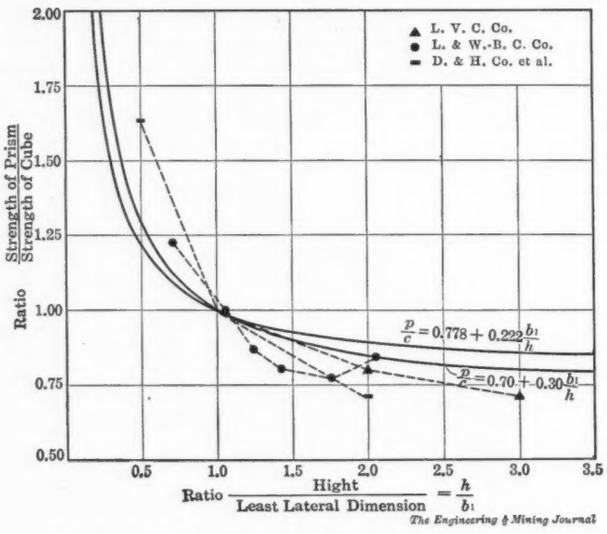

L. V. C. Co.
L. & W.-B. C. Co.
D. & H. Co. et al.
Strength of Prism / Strength of Cube
Ratio
$\frac{p}{c} = 0.778 + 0.222\frac{b_1}{h}$
$\frac{p}{c} = 0.70 + 0.30\frac{b_1}{h}$
Ratio Hight / Least Lateral Dimension $= \frac{h}{b_1}$
The Engineering & Mining Journal

FIG. 2. RELATION BETWEEN THE CRUSHING STRENGTH OF PRISMS AND CUBES

cover hereafter a considerable part of the coal in old workings where the pillars have been more or less crushed by the settling of the overlying strata; but this could be done only at increased expense, compared with the present mining costs, and is therefore not commercially practicable at the present time.

It is, of course, not practicable to determine accurately the unit pressure on coal pillars, by reason of the variations in density of the overlying strata. Moreover, the unit pressure will not vary directly as the depth, according to the law of gravitation; and normal unit pressure on the pillars, for constant depths and density of overlying strata, will be dependent upon the dip of the vein. However, the variations due to varying densities and the laws of gravitation are so slight for the conditions under consideration that they can be ignored; and the variation of the normal pressure due to dip, having little significance for the light dips characteristic of the northern anthracite field, may likewise be ignored. We may, therefore, reasonably say, for the conditions under consideration, that the pressure due to the overlying strata will vary directly as the depth below the surface.

The fracture of anthracite under compression occurs by shearing along planes at various angles to the direction of the applied force. The angle of fracture depends largely upon the brittleness of the coal; and the resistance to movement in these planes is made up of the shearing strength of the coal, and the frictional resistance along the plane, that is, the shearing component of the imposed load. This theoretical angle of rupture has been verified with many materials, but shows in the case of coal considerable variation, probably due to the lack of uniformity of the material.

The testing of anthracite coal specimens for compressive strength presents, therefore, many difficulties, and gives variable figures of crushing strength. Numerous tests are required for the determination of a fair average for even one size of specimens and one particular vein. The crushing strength of specimens from the various benches of a vein will vary to a greater or less extent, depending upon the vein. In the preparation of test specimens, there is difficulty in cutting the specimens to exact dimensions and in obtaining parallel and plane bearing surfaces. The specimens are liable to contain cracks, which are only revealed after loading. All these circumstances influence the results of the test. Anthracite test specimens are generally taken from the stronger benches of the vein. The comparative crushing strength of the various benches of a vein could probably best be arrived at by using drill cores, which could be cut into desirable lengths.

TABLE 1. AVERAGE RESULTS OF TESTS ON ANTHRACITE SPECIMENS

Name of Company	Ratio $\frac{h}{b_1}$	Crushing strength, Lb. per Sq.In.	Prism strength / Cube strength
P. & R. C. & I. Co.,			
(25 specimens)	1	2393	1.00
(25 specimens)	2	2296	0.96
L. V. C. Co.,			
(13 specimens)	1	1982	1.00
(13 specimens)	2	1591	0.80
(13 specimens)	3	1405	0.71
L & W.-B. C. Co.,			
(20 specimens)	0.71	3025	1.22
(20 specimens)	1.07	2566	1.00
(20 specimens)	1.24	2393	0.87
(20 specimens)	1.43	2008	0.81
(20 specimens)	1.77	2090	0.76
(20 specimens)	2.06	1880	0.84
D. & H. Co., *et al.*			
(146 specimens)	0.50	5113	1.63
(146 specimens)	1.00	3131	1.00
(146 specimens)	2.00	2234	0.71

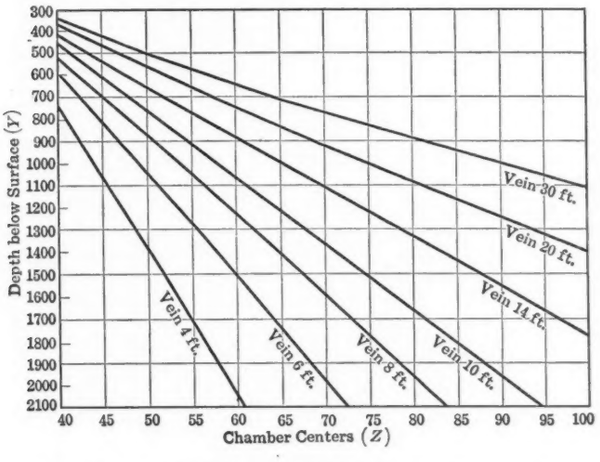


FIG. 3. THE RELATION BETWEEN DEPTHS AND CHAMBER CENTERS FOR VARIOUS THICKNESSES OF VEINS FOR 24-FT. CHAMBERS

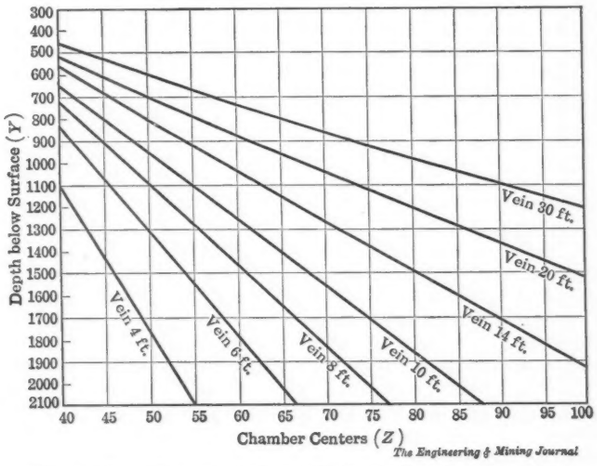


FIG. 4. THE RELATION BETWEEN DEPTHS AND CHAMBER CENTERS FOR VARIOUS THICKNESSES OF VEINS FOR 20-FT. CENTERS

TABLE 2. DEPTHS BELOW SURFACE FOR VARIOUS CHAMBER CENTERS AND THICKNESSES OF VEINS

		Thickness of Vein													
z.	b.	4	6	8	10	12	14	16	18	20	22	24	26	28	30
40	16	760	600	520	472	440	417	400	387	376	367	360	354	349	344
45	21	1062	817	694	621	572	537	510	490	474	460	449	440	432	425
50	26	1378	1040	871	770	702	654	617	589	567	548	533	520	509	499
55	31	1705	1268	1050	919	831	768	722	686	657	633	613	596	582	569
60	36	2040	1500	1230	1068	960	884	825	780	744	714	690	669	651	636
65	41	2381	1735	1411	1217	1088	996	926	873	830	794	765	740	719	700
70	46	2727	1971	1596	1367	1216	1108	1027	964	913	872	838	809	784	762
75	51	3077	2210	1777	1516	1343	1219	1126	1054	996	949	909	876	847	823
80	56	3430	2450	1960	1666	1470	1330	1225	1143	1078	1025	980	942	910	882
85	61	3786	2691	2144	1816	1597	1440	1323	1232	1159	1099	1049	1007	971	940
90	66	4143	2933	2328	1965	1723	1550	1421	1320	1240	1173	1118	1072	1032	997
95	71	4503	3176	2513	2115	1849	1660	1518	1407	1319	1247	1186	1136	1092	1054
100	76	4864	3420	2698	2265	1976	1770	1615	1495	1398	1320	1254	1198	1151	1110

Some Practical Tests

The compressive tests on coal specimens, reported below, were made by Prof. R. C. Carpenter[1], of Cornell University, and Joseph Daniels[2], of Lehigh University. Other tests reported in this paper were made by Mr. Daniels on specimens which I submitted.

The relation between the crushing strength and relative dimensions of Swiss sandstone has been studied exhaustively by Professor Bauschinger, as stated by Professor Johnson[3], and, as the result of these tests, he recommends for all shapes of cross-section and relative hights the formula:

$$p = \sqrt{\frac{1\sqrt{A}}{\frac{u}{4}}\left(a + b\frac{1\sqrt{A}}{h}\right)} \qquad (1)$$

in which

p = Crushing strength per unit area;
A = Area of cross-section;
u = Perimeter of cross-section;
h = Hight of specimen;
a and b = Constants.

A simpler formula for rectangular cross-sections is:

$$p = k + k'\frac{b_1}{h}, \qquad (2)$$

in which

b_1 = Least lateral dimension;
k and k' = Constants.

For the tests on sandstone, referred to above, this formula becomes:

$$p = 5500 + 1565\frac{b_1}{h}$$

in which

p = Crushing strength in pounds per square inch.

To show the relation between the strength of a prism and that of a cube, Professor Johnson derived, from the results of tests by Bauschinger, the equation:

$$\frac{\textit{Strength of prism}}{\textit{Strength of cube}} = 0.778 + 0.222\frac{b_1}{h} \qquad (3)$$

in which

b_1 = Least lateral dimension;
h = Hight of prism.

The tests on anthracite specimens previously referred to were made on various sizes of cubes and prisms; the cubes varying in size from 2 to 6 in., and the prisms from 2.25 to 12.25 in. in hight. These specimens were furnished by the Philadelphia & Reading Coal and Iron Company, the Lehigh Valley Coal Company, Lehigh & Wilkes-Barre Coal Company, Delaware & Hudson Company, and a number of others, and came from numerous veins, with the exception of those of the Lehigh & Wilkes-Barre Coal Company, which were taken from one vein. The results of these tests were tabulated with reference to the size of the specimens and ratio of hight to least lateral dimension. The averages were then obtained, and these results are given in Table 1.

These results are plotted in Fig. 1, showing the relation of crushing strength to $\frac{h}{b_1}$ and in Fig. 2, showing the relation of the strength of a prism to that of a cube, also in reference to $\frac{h}{b_1}$. It is evident, from these plottings, that coal prisms follow some law of strength relative to their hight and breadth.

In Fig. 1 the curve represented by the equation $p = 1750 + 750\frac{b_1}{h}$, which is based on a crushing strength of 2500 lb. per sq.in. for cubes, is plotted to show how well it fits the average results of the tests. In this figure there is also indicated, by concentric circles, the calculated pressures per sq.in. on chamber pillars, which have caused squeezes, and with which I am more or less familiar. In consideration of these unit pressures, a factor of safety is arrived at for practice; and the curve in Fig. 1, represented by the equation $p = 700 + 300\frac{b_1}{h}$, is taken for that purpose. This gives a crushing strength of 2500 lb. per sq.in., which is a fair average of the tests.

In Fig. 2 the curve represented by the equation

$$\frac{\textit{Strength of prism}}{\textit{Strength of cube}} = 0.70 + 0.30\frac{b_1}{h} \qquad (4)$$

is taken as best representing the results of these tests and other considerations. In Fig. 2, the equation

$$\frac{\textit{Strength of prism}}{\textit{Strength of cube}} = 0.778 + 0.222\frac{b_1}{h},$$

showing the law of variation of relative strength of prisms and cubes of sandstones, as evolved by Professor Johnson, is also plotted.

To arrive at a formula for proportioning pillars in the pillar-and-chamber system of mining, the weight of the overlying strata is taken at 144 lb. per cu.ft., Table II gives these relations for 24 ft.,

y = Depth below the surface;
b = Width of pillar;
z = Distance from center to center of chambers;
h = Total thickness of vein.

The load per square foot on a pillar will be:

$$\frac{144\,yzb_1}{b_1^2},$$

And with 1000 lb. per sq.in. or 144,000 lb. per sq.ft. as the safe loading for a cube we obtain by substituting in equation (4)

$$\frac{144\,yzb_1}{b_1^2} = 144{,}000\left(0.70 + 0.30\frac{b_1}{h}\right)$$

or

$$yz = 1000\left(0.70 + 0.30\frac{b_1}{h}\right)b_1 \qquad (5)$$

Should the "checker-board" system of mining, which is a modification of the pillar-and-chamber system, be used, the equation would become:

$$yz = 1000\left(0.70 + 0.30\frac{b_1}{h}\right)b_1^2 \qquad (6)$$

Tables II and III, diagrammatically represented in Figs. 3 and 4, show the relation between the depths and chamber centers for various thicknesses of veins,

TABLE 3. DEPTHS BELOW SURFACE FOR VARIOUS CHAMBER CENTERS AND THICKNESSES OF VEINS

		Thickness of Vein													
z.	b.	4	6	8	10	12	14	16	18	20	22	24	26	28	30
40	20	1100	850	725	650	600	565	538	517	500	486	475	465	457	450
45	25	1431	1083	910	806	736	687	649	620	597	578	562	549	538	528
50	30	1770	1320	1095	960	870	806	757	720	690	665	645	627	613	600
55	35	2116	1559	1281	1114	1002	922	863	817	779	748	724	703	684	668
60	40	2467	1800	1467	1267	1133	1038	967	912	867	830	800	774	753	733
65	45	2821	2042	1652	1419	1264	1152	1069	1003	952	909	874	844	818	796
70	50	3178	2285	1839	1571	1393	1265	1169	1095	1036	987	946	912	883	857
75	55	3538	2529	2025	1723	1522	1377	1270	1186	1118	1063	1017	978	945	917
90	60	3900	2775	2212	1875	1650	1489	1369	1275	1200	1139	1088	1044	1007	975
85	65	4263	3021	2399	2027	1778	1600	1467	1364	1281	1213	1156	1109	1068	1033
90	70	4628	3267	2586	2177	1906	1711	1566	1452	1361	1287	1225	1174	1128	1089
95	75	4994	3513	2773	2329	2096	2033	1663	1539	1441	1360	1293	1236	1187	1145
100	80	5360	3760	2960	2480	2160	1931	1760	1627	1520	1433	1360	1298	1246	1200

TABLE 4. DEPTHS BELOW SURFACE FOR VARIOUS CHAMBER CENTERS AND THICKNESSES OF VEINS

		Thickness of Vein													
z.	b.	4	6	8	10	12	14	16	18	20	22	24	26	28	30
40	16	666	548	489	453	427	413	400	390	382	376	370	366	362	358
45	21	907	726	635	581	539	518	499	484	472	462	454	447	441	436
50	26	1155	905	779	705	655	618	592	571	554	541	530	520	512	504
55	31	1408	1085	923	826	762	716	681	654	632	615	600	587	577	568
60	36	1666	1266	1066	946	866	811	766	733	706	684	666	651	638	626
65	41	1926	1448	1209	1065	969	901	850	810	777	751	730	711	695	682
70	46	2189	1630	1350	1182	1070	992	931	884	846	816	790	769	751	735
75	51	2454	1812	1492	1299	1170	1079	1010	957	914	880	850	825	804	780
80	56	2720	1995	1632	1415	1270	1166	1088	1028	980	938	906	880	855	833
85	61	2988	2178	1773	1530	1369	1252	1161	1098	1044	1000	963	932	905	880
90	66	3257	2361	1913	1645	1466	1338	1242	1167	1107	1060	1017	983	954	928
95	71	3525	2545	2054	1759	1563	1423	1318	1236	1187	1132	1086	1047	1014	985
100	76	3797	2728	2196	1873	1660	1507	1392	1303	1232	1173	1125	1084	1049	1019

[1] *Sibley Journal of Engineering*, Vol. XVI.
[2] Eng. and Min. Journ., Aug. 10, 1907.
[3] "Materials of Construction."

and were prepared from equation (5); Table II giving these relations for 24 ft., and Table III for 20 ft. width of chambers. I prepared Table IV several years ago from the equation:

$$yz = 1000\left(0.778 + 0.222\frac{b_1}{h}\right)b_1$$

which is based on the crushing strength of coal specimens at the first indication of failure, and a safe crushing resistance, for cubes, of 1000 lb. per sq.in. It is evident that, for the lower ratios of hight to width of pillars, this equation gives higher factors of safety than equation (5). For practical use, however, I believe that equation (5), from which Tables II and III were derived, is better for average conditions of veins and light dips.

The Question of Dip

The question of dip is important; and it is to be understood that the suggestions here given are applicable only to the light dips characteristic of the northern anthracite field; but I hope to give further consideration at some future time to this subject in its relation to heavy dips.

In the application of any formula to the calculation of the size of pillars necessary to resist safely the pressure of the overlying strata, consideration will have to be given to a number of conditions, such as the nature of the vein as well as its contiguous stratum, and the dip. Moreover, the factor of safety will be dependent upon local conditions, such as the relative location and extent of workings, and the seriousness of possible disturbance to the overlying strata and surface. In conclusion, I wish to say that I have derived a formula for shaft pillars, based on the same line of deduction, which will be presented at some future time. Meanwhile, I trust that the foregoing suggestion will incite other members of the Institute to offer their opinions on this subject, which will be of much value to all concerned.

British Coalite Company

London Correspondence

This British Coalite Company has again to report an unsuccessful year. When the prospectus asking for subscriptions was issued a few years ago, it was so extensively advertised, and so plausibly written, that the process of manufacturing coalite was regarded as the "invention of the century," as coke, tar, gas, benzol and sulphate of ammonia could be produced at a nominal figure. Unfortunately, the company has had more than its share of infantile diseases—as not a few gas engineers predicted—and even now that the patient has been placed under the care of another doctor, it may recover, but is never likely to attain gigantic proportions. Experiments made recently on a working scale show that the carbonization of coal at a low temperature was not the success anticipated; the gas produced is more than 50 per cent. less than in high-temperature carbonization, while the consumption of fuel is about equal; the yield of tar is more than double, yet the sulphate of ammonia is much less. The coke is much more suitable for domestic than for manufacturing purposes.

Dangers Attending Use of Explosives

In his paper, "Preliminary Result of Tests with Explosives in the Field," read before a recent meeting of the Mine Inspectors' Institute, Clarence Hall, explosives engineer, U. S. Bureau of Mines, expressed himself as follows:

"An accident which occurred recently in one of our large Western engineering projects and resulted in the death of nine workmen may be cited as a case which was caused by the excessive quantity of explosive used.

"In this work a tunnel was being driven through very hard rock. The explosive used was 40 per cent. gelatin dynamite, fired by fuse and detonators. The accident occurred soon after two headings had met. The use of air pipes had been discontinued and the ventilation depended upon the natural air currents. It was stated that the direction of the air current could not be depended upon and, as a matter of fact, had changed as many as three times during one shift. At the time this accident occurred the air current changed immediately after the blast and all powder smoke slowly swept over waiting workmen who had retired a distance of 400 ft. from the blast. Forty-eight holes had been drilled and loaded with 3½ lb. each of 40 per cent. strength gelatin dynamite. It was 15 min. after the blast before the men realized their danger and discovered that the gaseous products of combustion were having an injurious effect on them.

"Samples of this explosive were shipped to the Testing Station and the analysis showed that it is of uniform composition and made under a formula similar to the 40 per cent. strength gelatin dynamite generally offered in this country."

Results of Further Tests

Further tests were made and it was found that, "the charge used in this blast, namely, 168 lb. of 40 per cent. strength gelatin dynamite, would produce 48.5 cu.ft. of carbon monoxide gas (CO) and 29.05 cu.ft. of hydrogen sulphide gas (H_2S).

"Assuming that all the men had retired a distance of 400 ft. from the blast, and accordingly about 19,200 cu.ft. of air was available for diluting the gaseous products of combustion before coming in contact with the men, there would be present 0.25 per cent. carbon monoxide (CO), and 0.15 per cent. of hydrogen sulphide (H_2S), which would be sufficient to cause death under the conditions prevailing at that time.

"It is to be noted that the burning of a charge will generate a greater quantity of poisonous gases with the evolution of oxides of nitrogen than when the explosive is completely detonated. These conditions may obtain if weak detonators are used or if the explosives are frozen or chilled when used, but the evidence, namely, that the men remained in the powder smoke 15 min. before they realized their danger, would indicate that there were no considerable quantities of oxides of nitrogen present, for the reasons that these gases cause extreme pain when inhaled.

"In work of this kind artificial ventilation of some kind should always be adopted. A small furnace at the end of the tunnel, such as is used in the earlier development work in shallow coal mines, would probably have saved the lives of these men if it had been used; at the same time, artificial ventilation would insure better conditions in respect to the health of all men employed."

Consolidation of Cardiff Collieries

The Cambrian Collieries, of Cardiff, Wales, is a consolidation of coal-mining companies that has for its object the selling of coal and other products direct to the consumer without dealing with the sales agent. The leading spirit of this combination is David Alfred Thomas, whose father, in addition to working a colliery on a small scale, acted as sales agent for other companies. In 1886 the Cambrian Collieries, Ltd., was formed with a share capital of £600,000 of which £200,000 were debentures. In 1906 the Glamorgan Coal Company, owning 6000 acres adjoining and mining 1,000,000 tons annually, was added to the Cambrian.

The Glamorgan Company in addition to producing high-quality coal made firebricks at the rate of 10,000 per day and sold 100,000 tons of coke annually. The next property to be controlled was formerly owned by a French capitalist and produced 750,000 tons annually. The Britannia Merthyr, owning 1500 acres of good steam coal adjoining the above-named collieries, was also acquired. This colliery is being actively developed, although the present output is 200,000 tons. Three other collieries each with 500,000 tons output annually were brought into the combination.

The output at present is 4,350,000 tons yearly, and the capitalization is nearly £3,000,000. The company employs 15,000 miners at an annual cost of £1,200,000. The company controls a fleet of tramp steamers, has agencies in nearly all parts of the world, and acts as agent for other colliery companies.

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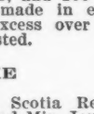

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15,871—PLATINUM — Application of the "Glow Reaction" to the Qualitative Detection of the Platinum Metals. L. J. Curtman and P. Rothenberg. (Journ. Am. Chem. Soc., May, 1911; 6½ pp.) 60c.

15,872—RARE METALS—Some Analyses of Rare Metal Ores. A. L. Sweetser. (Min. Sci., May 11, 1911; 1½ pp.) 20c.

15,873—TIN in Malaya. F. Douglas Osborne. (Min. and Sci. Press, Mar. 18, 1911; 2½ pp., illus.) 20c.

15,874—TIN MINING in the Netherland Indies. (Min. Journ., Apr. 15, 1911; 1 p.) 40c.

15,875—VANADIUM ALLOYS. George L. Norris. (Journ. Frank Inst., June, 1911; 24 pp., illus.) 60c.

15,876—ZINC—An Electric Furnace for the Smelting of Zinc. Francis A. J. Fitzgerald. (Min. Wld., May 6, 1911; 1⅔ pp., illus.) Paper before the Congress of Technology. 20c.

NONMETALLIC MINERALS

15,877—ASBESTOS—The Types, Modes of Occurrence, and Important Deposits of Asbestos in the United States. J. S. Diller. (U. S. Geol. Survey, Bull. 470-K; 20 pp.)

15,878—BAUXITE DEPOSITS of Southern Georgia. S. W. McCallie. (Eng. and Min. Journ., May 27, 1911; ¾ p., illus.) 20c.

15,879—CARBONS—Prospecting for "Black Diamonds." A. S. Atkinson. (Mex. Min. Journ., June, 1911; 1¼ pp.) 20c.

15,880 — DIAMONDS — Copeton Diamond Fields (N. S. W.) (Aust. Min. Stand., Apr. 20, 1911; 1 p.) 40c.

15,881—DOLOMITE for Flux in the Vicinity of Montevallo, Shelby Countyy, Alabama. Charles Butts. (U. S. Geol. Survey Bull. 470-K; 3 pp.)

15,882—FLUORSPAR near Deming, New Mexico. N. H. Darton and E. F. Burchard. (U. S. Geol. Survey Bull. 470-K; 13 pp.)

15,883—FULLER'S EARTH—The Production of Fuller's Earth in 1910. Jefferson Middleton. (Advance Chapter from Mineral Resources of the U. S., 1910; 8 pp.)

15,884—GARNET MILLING in New Hampshire. Earl S. Bardwell. (Eng. and Min. Journ., June 17, 1911; 1 p.) 20c.

15,885—GRAPHITE—A Theory for the Origin of Graphite as Exemplified in the Graphite Deposit near Dillon, Mont. Alexander N. Winchell. (Econ. Geol., Apr.-May, 1911; 13 pp.) 60c.

15,886—MAGNESITE—Ueber die Bildung alpiner Magnesitlagerstätten und deren Zusammenhang mit Eisensteinlagern. J. Hörhager. (Oest. Zeit. f. B. u. H., Apr. 22, 1911; 4 pp.) 40c.

15,887—MICA—The Production of Mica in 1910. Douglas B. Sterrett. (Advance Chapter from Mineral Resources of the U. S., 1909, 8 pp.)

15,888—PAINT SHALES of Pennsylvania. Benjamin L. Miller. (U. S. Geol. Survey, Bull. 470-I, 1910; 12 pp.)

15,889—PYRITES—Geology of the Phillips Pyrites Mine, near Peekskill, New York. Michael Heilprin Loveman. (Econ. Geol., Apr.-May, 1911; 16 pp., illus.) 60c.

15,890—QUARTZ AND FELDSPAR—The Production of Quartz and Feldspar in 1910. Edson S. Bastin. (Advance Chapter from Mineral Resources of the U. S., 1910; 15 pp.)

15,891 — SULPHUR — L'analisi degli solfi grezzi di Sicilia. A. H. Bennett. (Rassegna Mineraria, Apr. 1, 1911; 5¼ pp.) 40c.

15,892—SULPHUR DEPOSITS, near Soda Springs, Idaho. R. W. Richards and J. H. Bridges. (U. S. Geol. Survey, Bull. 470-J, 1910; 5 pp.)

PETROLEUM AND NATURAL GAS

15,893—ALASKA—Opening Alaska's Oilfields. W. T. Prosser. (Eng. and Min. Journ., June 3, 1911; ½ p.) 20c.

15,894—CALIFORNIA—Geology and Topography of California Oil Fields. Arthur Lakes. (Min. Sci., May 4, 1911; 1 p., illus.) 20c.

15,895—DERRICKS—Steel Derricks and Drilling Rigs. R. B. Woodworth. (Progressive Age, June 15, 1911; 8 pp., illus.) Paper before Nat. Gas Assn. of America, May, 1911. 20c.

15,896—GEOLOGY — Anticlinal Structure and Its Relation to Oil. Arthur Lakes. (Min. Wld., June 10, 1911; 3 pp., illus.) 20c.

15,897 — MEXICO — Zonas Probables de Acumulacion del Petroleo, en el Subsuelo de las Mejores Regiones Petroliferas de Mexico. Juan D. Villarello. (Bol., Sociedad Geologica Mexicana, Vol. VII, Part 1, 1910; 8 pp.)

15,898—NATURAL GAS—Machinery Used for Pumping Natural Gas. E. S. McClelland. (Progressive Age, June 15, 1911; 2½ pp.) Paper before Nat. Gas Assn. of America, May, 1911. 20c.

15,899—PROSPECTING—How to Go about Prospecting for Petroleum. (Min. Sci., June 15, 1911; 3½ pp., illus.) Concluding article of series dealing with the geology of oil. 20c.

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ECONOMIC GEOLOGY—GENERAL

15,902—ARIZONA—Geology of the Globe District, Arizona. F. L. Ransome. (Min. and Sci. Press, June 3, 1911; 1 p., illus.) 20c.

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15,904—MEXICO—Diversas Zonas Mineralizadas, en los Principales Criaderos Metalliferos de Mexico. Juan D. Villarello. (Bol., Sociedad Geologica Mexicana, Vol. VII, Part 1, 1910; 14 pp.)

15,905 — MISSOURI-ILLINOIS — Geology and Mineral Resources of the St. Louis Quadrangle, Missouri-Illinois. N. M. Fenneman. (U. S. Geol. Survey, Bull. 438, 1911; 73 pp., illus.)

15,906—ORE DEPOSITS and Receptacle-Making Processes. G. W. Miller. (Min. Wld., May 13, 20, 27 and June 10, 1911; 7 pp., illus.) 80c.

15,907—ORE DEPOSITS—Genesis of Ore Deposits. George J. Bancroft. (Proc. Colo. Sci. Soc., Mar., 1911; 16 pp.)

15,908—WYOMING—Sunlight Mining District, Wyoming. J. H. East, Jr. (Eng. and Min. Journ., June 10, 1911; ⅔ p.) 20c.

MINING—GENERAL

15,909—ACCIDENTS—The Prevention of Mine Accidents. J. Bowie Wilson. (Eng. and Min. Journ., May 27, 1911; 2 pp.) 20c.

15,910—ACCOUNTING—Simple Mine Bookkeeping. K. C. Parrish. (Min. and Sci. Press, June 3, 1911; 2½ pp.) 20c.

15,911—BOLIVIA—Mining Conditions in Bolivia. Geo. N. Dean. (Mex. Min. Journ., June, 1911; 2 pp., illus.) 20c.

15,912—BRITISH COLUMBIA—The Standard Mine, Silverton, B. C. John Vallance. (Eng. and Min. Journ., June 10, 1911; ⅔ p.) Abstract of paper before Western Branch, Can. Min. Inst., May 18, 1911. 20c.

15,912a — BORE-HOLE DEFLECTIONS—Causes of Bore-Hole Deflections in the Transvaal. J. S. Curtis. (Min. Wld., Apr. 29, 1911; 3 pp., illus.) 20c.

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15,914 — DRAINAGE — Bailing Water at Coleman Shaft, Cambria County, Pennsylvania. F. E. Brackett. (Mines and Minerals, May, 1911; 1½ pp., illus.) 20c.

15,915—DRILLING—Neuere Verfahren zur Erlangung zuverlässiger Bohrergebnisse. Schweinitz. (Glückauf, Mar. 18, 1911; 6¾ pp., illus.) New methods for obtaining reliable results in drilling. 40c.

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15,917—ELECTRICITY—Special Risks in the Application of Electricity to Mining Work under S. African Conditions. H. J. S. Heather. (Electrician, May 12, 1911; 3 pp.) 40c.

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15,922—HOISTING—Electric Winding Developments. Francis Thursfield. (Mechan. Wld., Apr. 14, 1911; 2 pp., illus.) 20c.

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15,928—MEXICO—Traveling in Mexico. C. S. Thomas, Jr. (Eng. and Min. Journ., June 17, 1911; 2⅔ pp.) 20c.

15,929—MINE TRACK. Alvin R. Kenner. (Eng. and Min. Journ., May 27, 1911; ⅔ p., illus.) 20c.

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15,931—ORE HANDLING—The Kimberley System of Handling Large Quantities of Ground in the Minimum of Time, with Notes Regarding the Life of Wire Ropes. Alpheus Williams. (Journ. South African Inst. of Engrs., May, 1911; 5⅓ pp.) Discussion on paper previously indexed. 60c.

15,932—PRODUCTION of Metals and Metallic Ores in 1908 and 1909. Waldemar Lindgren. (Advance Chapter from Mineral Resources of the U. S., 1909; 7 pp.)

15,933—PRODUCTION — Summary of the Mineral Production of the United States in 1909. W. T. Thom. (Advance Chapter from Mineral Resources of the U. S.; 59 pp.)

15,934—SHAFT SINKING—Difficulties Encountered in Sinking a Small Shaft. William H. Storms. (Min. Wld., Apr. 22, 1911; 3⅓ pp., illus.) 20c.

15,935—SLICING SYSTEM—Mitchell Slicing System in Operation in Arizona. Clarence L. Larson. (Min. Wld., May 6, 1911; 4 pp., illus.) 20c.

15,936 — SURVEYING — Some Surveying Problems. E. R. Rice. (Min. and Sci. Press, Apr. 22, 1911; ¾ p., illus.) 20c.

15,938—TIMBERING—Corner Framing of Shaft Timbers. W. H. Storms. (Eng. and Min. Journ., May 27, 1911; ½ p.) 20c.

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ORE DRESSING—GENERAL

15,940 — CRUSHING — Comparative Efficiencies of Crushing Plants. G. A. Denny. (Mex. Min. Journ., June, 1911; 2¾ pp.) 20c.

15,941—CRUSHING — Comparative Grinding Experiments, with a Chilean Mill and a High-Speed Roll at the Detroit Copper Company's Concentrator, Morenci, Ariz. R. Gahl. (Met. and Chem. Eng., June, 1911; 2¾ pp., illus.) 40c.

15,942—ELECTROSTATIC SEPARATION—Midvale Plant of the United States Smelting Company. Leroy A. Palmer. (Min. Wld., 2⅓ pp., illus.)

15,943—FLOW SHEETS—Standardization of Conventional Signs for Flow Sheets. James Spiers. (Pacific Miner, May, 1911; 2 pp., illus.) 20c.

15,944—ORE TREATMENT—Midvale Plant of the United States Smelting Company. Leroy A. Palmer. (Min. Wld., May 6, 1911; 3⅔ pp., illus.) 20c.

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15,946—ALLOYS — Zusammensetzung der gebräuchlichen Metallegierungen. E. W. Kaiser. (Metallurgie, May 8 and 22, 1911; 23½ pp.) Composition of the metallic alloys in common use. 40c.

15,947—ELECTRIC SMELTING—Ueber das reduzierende Verschmelzen oxydischer Erze im elektrischen Ofen. W. Borchers. (Metallurgie, Apr. 22, 1911; 2 pp., illus.) On the reducing smelting of oxodized ores in the electric furnace. 40c.

15,948 — INDEXING LITERATURE — An Extension of the Dewey System of Classification applied to Metallurgy, Metallography and Assaying. Robert M. Keeney. (Quart. Colo. Sch. of Mines, Apr., 1911; 108 pp.)

15,949—METALLOGRAPHY and Its Industrial Importance. Albert Sauveur. (Journ. Ind. and Eng. Chem., June, 1911; 2 pp.) Abstracted from a paper before the Congress of Technology, Apr. 11, 1911. 60c.

15,950—ORE REDUCTION in the Harz. O. H. Hahn. (Eng. and Min. Journ., June 3 and 10, 1911; 7⅔ pp., illus.) Includes descriptions of smelteries of Clausthal, Lautenthal, St. Andreasburg and Altenau. 20c.

15,951—SINTERING FLUE DUST, ETC.—Down-Draft Sintering Experiments at Smeltery of the Reforma Mining and Milling Company. A. W. Hahn. (Eng. and Min. Journ., June 17, 1911; 1¼ pp., illus.) 20c.

15,952 — SMELTING PLANT — Midvale Plant of the United States Smelting Company. Leroy A. Palmer. (Min. Wld., May 20 and 27, 1911; 7⅓ pp., illus.) 40c.

15,953—SULPHIDES—Das Verhalten con Bariumsulfat und Calciumsulfat gegen die wichtigeren Metallsulfide bei Gegenwart freier Kieselsäure. W. Schültz. (Metallurgie, Apr. 22, 1911; 18¼ pp., illus.) Behavior of barium sulphate and calcium sulphate towards the more impartant metal sulphides in the presence of free silica. 40c.

15,954—WHITE METAL—Untersuchungen über Lagermetalle. I. Weissmetall. E. Heyn and O. Bauer. (Stahl u. Eisen, Mar. 30, 1911; 4 pp., illus.) Investigations on metals used for bearings. I. White Metal. 40c.

MINING AND METALLURGICAL MACHINERY

15,956—AIR COMPRESSORS—Horizontal Air-Compressing Engines at Pope & Pearson's Collieries, Normanton. (Engineer, June 2, 1911; 1½ pp., illus.) 40c.

15,957 — DRILL — Die Handdresbohrmaschine von Auer. T. Breuer. (Glückauf, Apr. 15, 1911; 2½ pp., illus.) 40c.

15,958—ELECTRIC MOTOR — The Gas-tight and Flame-Proof Motor Problem. Talbot Duckitt. (Electrician, May 12, 1911; 5 pp., illus.) 40c.

15,959—ELECTRICITY in Cornish Mines. Neil Taylor. (Electrician, May 12, 1911; 3½ pp., illus.) 40c.

15,960—ELECTRICITY—The Modification of Mining Methods by Electrical Machinery. R. W. Hutchinson, Jr. (Eng. Mag., May, 1911; 27¼ pp.) Second article of series dealing with electric distribution, haulage and lighting. 40c.

15,961—GAS PRODUCERS. J. Emerson Dowson. (Electrician, June 2, 1911; 2 pp., illus.) 40c.

15,962—HOISTING — Notes on Contrivances Designed to Prevent Overwinding, with Some Instances of Their Failure. W. H. Pickering and Granville Poole. (Iron and Coal Tr. Rev., June 2, 1911; also Coll. Guardian, June 2, 1911; 1¼ pp.) Paper before Instn. of Min. Engrs. 40c.

15,963—HOISTING ENGINES—The Driving of Winding Engines by Induction Motors. H. J. S. Heather. (Coll. Guardian, May 12, 1911; 2½ pp., illus.) Paper before Instn. of Elec. Engrs. 40c.

15,964—HYDRO-ELECTRIC Plant on the Vermillion River, Ontario, at Watageslick Falls, Installed 1908 by Allis-Chalmers-Bullock Company for Mond Nickel Company. A. Shanks. (Can. Engr., May 18, 1911; 7¾ pp., illus.) 20c.

15,965—HYDROELECTRIC PLANT — The Cassilis Hydro-Electric Plant, Gippsland, Victoria. A. Allison. (Austral. Min. and Eng. Rev., Apr. 5, 1911; 6¼ pp., illus.) 40c.

15,966 — PUMPS — Die Durchbildung der Bohrlochpumpen mit bewegten Maschinenteilen unter Tage. H. Wettich. (Zeit. des Vereines deutsch. Ing., Apr. 22 and 29, 1911; 11¼ pp., illus.) Improvements in deep well pumps with moving parts underground.

15,967—SWITCHGEAR—Notes on Switchgear for Use Underground in Mines. H. W. Clothier. (Electrician, May 12, 1911; 6 pp., illus.) 40c.

15,968 — SWITCHBOARDS of the New Kleinfontein Consolidated Gold Mining Company. (Electrician, May 12, 1911; 3 pp., illus.) 40c.

SAMPLING AND ASSAYING—GENERAL

15,971—ARSENIC IN PYRITES—Die Arsenbestimmung in Kiesen. G. Hattensaur. (Oest. Zeit. f. B. u. H., Apr. 1, 1911; 3¼ pp.) Determination of arsenic in pyrites. 40c.

15,972—CARBON—The Microscopic Examination and Identification of Carbon. G. A. Roush. (Journ. Ind. and Eng. Chem., 10½ pp., illus.) 60c.

15,973—COPPER IN PYRITES—Eine neue Methode zur Bestimmung von Kupfer in Schwefelkiesen und ihren Abbränden. Iwanow. (Chem. Ztg., May 18, 1911; ½ p. Translated in Eng. and Min. Journ., June 17, 1911.) A new method for determining copper in crude and spent pyrites. 20c.

15,974—ELECTROANALYSIS—Adaptation of the Tap-Funnel to Rapid Electroanalysis with Stationary Electrodes. T. Slater Price and A. W. T. Hyde. (Journ Soc. Chem. Ind., Apr. 15, 1911; 5½ pp.)

15,975—INTERFEROMETER—Einige Anwendungen des Interferometers. Klemperer. (Chem. Ztg., May 25, 1911; 1½ pp., illus.) Some applications of the interferometer. 40c.

15,976—IRON IN SAMPLES—Contamination of Laboratory Samples by Iron Derived from Crushing Machinery. George A. James. (Pacific Miner, May, 1911; ½ p.) 20c.

15,977—RARE METAL ORES, Some Analyses of. A. L. Sweetser. (Min. Sci., May 11, 1911; 1½ pp.) 20c.

INDUSTRIAL CHEMISTRY

15,979 — AMMONIA FROM PEAT — Die Ammoniakgewinnung aus Torf. Caro. (Chem. Ztg., May 11 and 13, 1911; 3½ pp.) The extraction of ammonia from peat. 40c.

15,980—ATMOSPHERIC NITROGEN—Recent Progress in the Fixation of Atmospheric Nitrogen. John B. C. Kershaw. (Elec. Wld., Apr. 27, 1911; 3 pp., illus.) 20c.

15,981—SULPHURIC ACID — Gewinnung von Schwefelsäure durch Oxydation der schwefligen Säure mittels Stickoxyde ohne Bleikammern. H. Petersen. (Chem. Ztg., May 9, 1911; 1½ pp.) Manufacture of sulphuric acid by oxidation of the sulphurous anhydride by means of the oxides of nitrogen without lead chambers. 40c.

15,982—WHITE LEAD—The Hygiene of the White Lead Industry. Alice Hamilton. (Journ. Ind. and Eng. Chem., June, 1911; 3¾ pp.) 60c.

MATERIALS OF CONSTRUCTION

15,983—CEMENT MILL—Electrical Equipment of the Plant of the Allentown Portland Cement Company, Evansville, Penn. (Elec. Wld., May 11, 1911; 1¼ pp., illus.) 20c.

15,984—CONCRETE, Its Manufacture and Use. Algernon Del Mar. (Min. and Sci. Press, Apr. 15, 1911; 2 pp.) Includes description of concrete foundations for stamp mills. 20c.

15,985—CONCRETE FROM SLAG—Zur Frage des Schlackenbetons. A. Knaff. (Stahl u. Eisen, Mar. 9, 1911; 7 pp.) 40c.

15,986—CONCRETE FROM ZINC TAILINGS—Utilizing Zinc Tailings in Missouri-Kansas-Oklahoma District. L. L. Wittich. (Mines and Minerals, May, 1911; 2¼ pp., illus.) 20c.

15,987—FERRO-CONCRETE—Die Vorzüge und Nachteile des Eisenbetons. Rohland. (Chem. Industrie, Dec. 1, 1910; 4 pp.) Advantages and drawbacks of ferro-concrete. 40c.

15,988—FIRE BRICKS. E. M. Stewart. (Gas Engrs.' Mag., Jan. 16, 1911; 2 pp.) 40c.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

A. S. Dwight has gone on a Western trip.

Dr. Otto Sussman is back in New York from a prolonged Western trip.

Philip Argall left Denver on June 18 for an extended trip in Alaska.

Robert S. Botsford has arrived in London from Rio Grande do Sal, Brazil.

Prof. F. G. Cottrell, of the University of California, was a recent visitor in New York.

R. Gilman Brown and W. G. Perkins are on a visit to the Kyshtim works, in the Urals, Russia.

J. Parke Channing is at Great Barrington, Mass., and expects to return to New York early in July.

H. A. Tobelmann, smeltery chemist of the Calumet & Arizona Company, is at Basking Ridge, N. J., on a vacation.

W. Weston & Son have moved from Silao, Guanajuato, to Mexico City with temporary headquarters at the St. Francis hotel.

F. Burbidge, of Spokane, Wash., has accepted the position of general manager for the Idaho-Continental Mining Company.

B. B. Thayer, president of the Anaconda Copper Company, sails for Europe on July 1. He will return early in September.

W. R. Rust, of Tacoma, Wash., is now chairman of the Federation of Employers' Associations, recently organized on Puget Sound, Washington.

Robert E. Cranston, of Sacramento, Cal., is examining some placer properties near Grangeville, Idaho, at the big bend of Salmon river.

Dr. Kuno Heberlein, general manager of the Compania Minera de Penoles, spent two days in New York this week, on his way to Europe.

John F. Wallace, at one time chief engineer of the Panama Canal, has been chosen president of Westinghouse, Church, Kerr & Co., New York.

John G. Rogers, Philadelphia; C. Caperon, Washington; S. D. Rond, Jamaica, N. Y., and W. King, Belfast, Ireland, have been visiting Porcupine, Ontario.

John F. Coats, superintendent of the Princeton Collieries, Ltd., Vancouver, B. C,. is opening a coal mine for that company near Princeton, Similkameen.

William J. Cox, consulting engineer of the Camp Bird Company, has returned to Denver from a visit of inspection to the Santa Gertrudis mine, Pachuca, Mexico.

Charles Camsell, of the Canada Geological Survey, has commenced his season's fieldwork at Tulameen, B. C., in which district he last year found rock containing diamonds.

James Epperson, of Linton, Ind., former State mine inspector has been appointed superintendent of four of the largest mines in this Linton field with headquarters in Evansville.

Frederic Keffer is directing the exploration of the McKinley mine, in Franklin camp, Boundary, B. C., recently taken under option of purchase by the British Columbia Copper Company.

John A. Rice has left El Paso, Tex., for the summer to take charge of the prospecting of the property of the Cicero Smith Mining Company in the foothills of the Dos Cabezas mountains in Arizona.

J. R. Hendra has resigned as general manager of the Santo Domingo mine at Aduana and accepted a position as mine superintendent with Palmarejo Goldfields, Ltd., at Palmarejo, Chihuahua, Mexico.

Earl C. Galbraith, a recent graduate of the Mining Department of the State College of Washington, has been appointed mineral examiner to the United States Land Office and is stationed in Montana.

C. H. Repath is at Douglas, Arizona, designing a smelter for the Calumet & Arizona Mining Company. The work consists in part of remodeling the old plant and building new additions for a new blast furnace plant, reverberatory and roaster plant, and a new converter plant.

W. H. Grady, has resigned as superintendent of the Seaboard Coal and Coke Company at Coal City, Ala., and has been appointed chief engineer of coal mines of the Tennessee Coal, Iron and Railroad Company, with headquarters at Birmingham, Ala. He succeeds H. B. Wright, who has resigned.

Waldermar Lindgren, of the U. S. Geological Survey, is at National, Nev., about 75 miles north of Winnemucca, making a survey of that district, which is noteworthy for the extraordinary high grade of its gold ore. Mr. Lindgren expects to make a trip east early in July, after which he will return to Nevada.

George L. Hurst, engineer in charge of the gold dredging and hydraulic mining machinery manufacture for the Risdon Iron Works, San Francisco, will be in charge of the dredge-building department of the Union Iron Works, going to the Union upon the succession of that compony to the mining machinery and boiler manufacturing business of the Risdon.

T. R. Brooks who for 16 years has been with the Risdon Iron Works and for several years past sales manager of the mining department, goes to the Union Iron Works under the supervision of R. H. Postlethwaite, chief of the mining department. This arrangement is effective July 1, Mr. Brooks is well known in the mining fields of the West as a careful and capable man, who has many friends, and will be a valuable acquisition to the selling force of the Union Iron Works.

OBITUARY

David Henry Jarvis shot and killed himself at Seattle, Wash., June 23. He was 49 years old and was born in Maryland. He entered the Revenue service in 1883 and was for a number of years employed in Arctic exploration and on the Alaskan coast. Later he was connected with the Alaska Commercial Company and the Northwestern Fisheries Company, and was for a time collector of customs. He was largely interested in mines at Nome and elsewhere in Alaska, and was concerned in the organization of the Morgan-Guggenheim syndicate.

S. H. C. Miner, formerly president of the Granby Consolidated company, of British Columbia, died at Granby, P. Q., on June 9, at the age of 76. He was closely connected with the municipal and industrial affairs and president of the Granby Rubber Company, in addition to being heavily interested in other local enterprises. Mr. Miner was more widely known, however, in connection with the mining industry of British Columbia, having taken a prominent part in the establishment of the Granby smelting works, at Grand Forks, and the subsequent consolidation of various properties into the Granby Consolidated company, the presidency of which he occupied for seven years, until 1904, when he resigned.

SOCIETIES and TECHNICAL SCHOOLS

University of Illinois—The appropriations made by the Illinois legislature for the current year include $192,000 for maintenance and $200,000 for buildings for the college of engineering; $35,000 for maintenance and $25,000 for new equipment for the mining department.

South Dakota School of Mines—At the annual commencement, held the first week in June, the following were granted the degree of engineer of mines: Frank B. Bryant, R. F. Coolidge, Otto Ellerman, Herbert N. Read, Fred Winters. The address was delivered by Hon. A. E. Hitchcock, president of the State board of regents.

State College of Washington—The senior class of the Mining Department recently completed a tour of the mining camps of Washington and British Columbia. The class was accompanied by Francis A. Thomson, head of the department, and visited the mines and mills of Republic, Wash., the smelters and mines of the Boundary country and the Consolidated Company's properties and plants in Rossland and Trail, in addition to other points of minor interest.

Editorial Correspondence

Reports from our own Representatives on Important Events from Many Important Mining Centers of the World

San Francisco

June 21—The smeltery of the Balaklala Copper Mining Company at Coram, Shasta county, will be closed indefinitely about July 25 in pursuance of a stipulation made between the company's attorneys and counsel for the complainant farmers filed in the U. S. Circuit Court at San Francisco June 20. The recurring and expensive litigation instituted by the farmers of Shasta county, notwithstanding the efforts of the copper company to control or neutralize the smoke of the smeltery to meet the demands of the farmers and in conformity to the court's injunction, and the improbability of accomplishing satisfactory results through the employment of the Cottrell device at present, induced this course. The stipulation provides that the company may continue operating until it has completed the smelting of 10,000 tons of ore that has been accumulated, or as much of the accumulation as can be treated within 35 days. What further course the company will pursue had not been announced at the time of filing the stipulation; whether other methods or experiments will be undertaken at Coram, or the smeltery be removed to another district or State where cultivation of agricultural lands will not be interfered with. Only one smeltery treating copper ores, is now in operation in Shasta county. Since the successful establishment of the baghouse at Kennet, the Mammoth smeltery has succeeded in avoiding further litigation with the farmers. It is understood from the Balaklala stipulation that the company has no intention of permanently ceasing smelting; and since the Bully Hill smeltery is about to conclude the experiments that have been in progress for the last year, there is a prospect that the smelting industry will be fully resumed, ultimately.

A warrant for the arrest of D. H. Dunn, promoter of the Pacific Consolidated Stone Company, has been issued on complaint of State Mineralogist Aubury, on a charge of issuing a false prospectus. The alleged misrepresentations consisted of false pictures as well as false statements of properties in Inyo county and in Arizona. One investor is alleged to have made a $2500 payment on 7500 shares at the full price of $13,000. These prosecutions for false representation of mining properties have been successful in the way of securing convictions; but in the stopping of fraudulent schemes there seems to have been little result. Even the fear of prosecution by the Federal Government on fraud orders issued by the Post Office Department has not acted as a deterrent. Dr. C. Howard Merritt, who was convicted in the Superior Court at Oakland, and who sought the Supreme Court in appeal, is now in the hands of the postal authorities on a fraud order issued June 1, based on this conviction and the evidence adduced by the State mineralogist. Another of these fraudulent operators in mines or supposed mines was convicted in Los Angeles on June 16 on complaint of a victim who had purchased of Rev. W. R. Price, of Long Beach, 1000 shares in the National Gold Dredging Company for $1000. Price, on second trial was found guilty of obtaining money under false pretenses. The labor of running down these swindlers is laudable, but almost ineffective in preventing the promotion of schemes and the warning of prospective victims.

Denver

June 24—Four Cripple Creek companies have already made dividend announcements. The Golden Cycle is paying $30,000 the first of each month in dividends. A dividend of 1½c. per share, amounting to $37,500, will be paid June 24, by the Elkton Consoldated Gold Mining Company; this is the regular quarterly dividend. The El Paso Gold Mining Company will pay, June 30, a dividend of 1c. per share, amounting to $24,500. A dividend of 1c. per share, amounting to $13,093, will be paid June 30, by the Mary McKinney company. It is predicted that the June production of Cripple Creek will approximate 90,000 tons, worth about $1,400,000. The increase in tonnage is due to 15,000 tons output from the Isabella mill. With the Isabella mill treating a greater tonnage than any other plant in the district, which is due to the fact that it is not necessary to grind the tailings, the local plants will treat about 37,000 and the valley plants and the smelteries about 43,000 tons.

A big rush is on from Mancos and other towns in that part of the State to the east and west of Mancos discoveries made during the last few weeks. Leckenby and Owens, a few days ago, uncovered bonanza ore in the workings of a property that has been idle for many years, and which was overlooked by the former owners. It is reported that this property was once owned by Capt. G. J. Jackson, who first discovered gold in Clear Creek county in the early '60's. This ore is rich and when broken, crushed and panned, rusty gold nuggets as large as wheat grains are disclosed. The discovery made by Miceli promises to be as rich. In panning the ore he found quantities of rusty gold and one nugget as large as a bean. There is much excitement in Mancos, where nearly everyone is planning to go to the diggings to locate new ground or acquire claims that were staked years ago and later abandoned after little work had been done on them. At the present rate there will be 200 prospectors in the district within the next 10 days.

An interesting exception to the usual rule concerning the width of mining claims became a matter of history last week when Governor Shafroth approved an act of the legislature to remove the limits that had hitherto existed in four counties of this State, namely, Gilpin, Clear Creek, Boulder and Summit. Soon after the adoption of the national mining law of 1872, a Colorado legislature adopted 300 ft. as the maximum width of all claims under its jurisdiction, except in the four counties mentioned, the maximum width being 150 ft. It is this limitation that has been removed by the act just adopted. The law will become effective in 90 days.

Salt Lake City

June 22—Ore purchases and bullion shipments for the week ended June 18 were the largest for any week in 1911, reaching a total value of $1,225,000. The bullion shipped to the Eastern refineries amounted to $555,000 exclusive of gold, as the larger part of the gold, which was formerly included in these shipments, now goes to the local United States Assay Office. The ore purchased amounted to $670,000. This increase in ore purchases and bullion shipments promises some new dividends among Utah mines during the second half of the year, or at least a continuation and probably an increase in the dividends at present being paid. For the first half of the year the mines of Utah paid dividends amounting to more than two and one-half million dollars, exclusive of the dividends of the American and International Smelting Companies, which make a part of their profits from operations in this State. The dividend payers are the Utah Copper, the United States Smelting, Refining and Mining, including the Centennial-Eureka,

Iron Blossom, Bingham-New Haven, Colorado, Daly West, Sioux Consolidated, Cliff, Uncle Sam Consolidated, and Opohongo. It is estimated that the total dividends for the year will approach the $6,000,000 mark.

A bond of a million dollars was filed in the United States District Court, June 17, by the Silver King Coalition Mines Company in the case of the Silver King Consolidated *versus* the Coalition, in which the Consolidated was awarded a judgment for about $730,000 as its share in ore extracted by the Coalition from jointly owned territory. The case will be taken by the Coalition company to the United States Circuit Court of Appeals. The judgment bears interest at 8 per cent. from April 17 and is a lien on the property of the defendant. Now that the bond has been filed and approved, the appeal will be perfected. The bond represents security in the form of property and is signed among some of the principal stockholders as follows: Thomas Kearns, $250,000; David Keith, $250,000; James Ivers, $100,000; W. V. Rice, $100,000; W. S. McCornick, $100,000; Moylan C. Cox, $100,000; Susan B. Emery Holmes, $50,000; Grace Emery Bransford, $50,000.

At a meeting of the State Conservation Commission, June 20, the new map showing Utah's resources, on which the commission has been at work for more than a year and a half, was examined and discussed. The map includes much valuable data and is larger and better than any map yet made showing the natural resources of the State. There are some errors, however, which will have to be corrected before the map is accepted. The scale is 6 miles to an inch. When completed, the map will be sold at cost by the State. The conservation commission is composed of Gov. William Spry, B. B. Mann, Joseph F. Merrill, O. J. Salisbury, George Austin and Thomas L. Allen.

Birmingham, Ala.

June 24—The International Harrow and Cultivator company, capital stock $500,000, has started operations at its first plant at North Birmingham. Announcement is made that the merger committee of the Alabama Consolidated Coal and Iron Company and the Southern Iron and Steel Company, organizing the Alabama Consolidated Coal, Iron and Steel Company, has started negotiations for furnishing the new company with $5,000,000 capital to be used in making improvements and getting down to a good business basis. H. S. Matthews, of Birmingham, vice-president and general manager of the Alabama Consolidated, is to be president of the new company. Hayden, Stone & Co., of New York, and the Blair syndicate of Detroit, are said to be the interests financing the merger. Samuel Untermeyer, general counsel of the company, has gone to London to arrange details with London stockholders in the Southern Iron and Steel Company.

Cobalt

June 23—There has been a good deal of disappointment over the failure of the La Rose company to increase the dividend from the present rate of 2 per cent. quarterly. The company now has a cash surplus of $1,300,000 and the ore reserves are valued at $3,000,000. This, taken in connection with the favorable conditions at the different properties, makes an excellent showing. Some of the directors are known to have been in favor of the increase, but it was opposed by Mr. McGibbon the president. Had it not been for the shortage of power, which delayed operations at the mines, the increase might have been granted, but Mr. McGibbon is anxious to build up a large cash and ore reserve, so as to avoid the possibility of another fiasco.

Porcupine

June 23—During the last few days there has been a great rush of prospectors into Bristol township, about 10 miles southwest of the Hollinger mine, where the discovery of the Bridge claim is causing great excitement. The vein is about 200 feet wide and has produced some spectacular gold samples. Although a large number of claims are being staked there are but few exposures of rock, the country being swampy, so that staking has been by locality alone, no discoveries being possible. The formation is pronounced to be slightly different from that of Tisdale, the quartz and gold being associated with a quartz porphyry with a contact of granitic rock in some places. The find is regarded as significant in showing the extent of the gold-bearing area, and prospectors are covering a wide stretch of country, extending into the Sudbury district.

Good progress is being made with the Porcupine railroad, and the Commission is endeavoring to provide regular trains as far as the Frederickhouse river.

Another power company will be formed to supply electric energy to the Porcupine camp from High falls on the Frederickhouse river, 26 miles distant. The falls have a hight of 14 ft., and by damming the river a 46-ft. head of water can be secured. Surveyors are now at work making a preliminary examination of the ground. D. C. Clark has a lease of the water-power from the Government.

The rush to Swastika, in consequence of recent discoveries, has resulted in the growth of a small settlement at this point, with a hotel and several rooming and eating houses. A steady influx of prospectors is in progress and a considerable portion of the country between Swastika and Larder lake has been staked.

Chihuahua

June 18—Since the first of June mining operations throughout northern Mexico and particularly in the states of Chihuahua, Coahuila and Durango have been resumed and are assuming normal proportions as rapidly as supplies and ore can be moved over temporarily repaired railroads. Trains are running regularly over the main line of the National between El Paso and Mexico City and even on the majority of the important branches, such as the Jimenez-Rosario and Torreon-Tepehuanes. As the repairs thus far made are of temporary character only and as the rainy season now approaching will cause further delays, it is anticipated that traffic will be irregular.

The Chihuahua smeltery of the American Smelting and Refining Company now has two furnaces in blast but it is unlikely that more than one more will be blown in for several weeks on account of an inadequate coke supply and a scarcity of labor. The Torreon smeltery is again operating at nearly normal capacity while the Velardeña plant of the American Smelters Securities Company, and the Mapimi works of the Peñoles Mining Company are running.

Little ore has thus far been moved, but as soon as the railroads are in shape and cars are available large accumulated tonnages will be despatched, particularly from points along the branch lines where traffic has been more or less interrupted for five months. Considering the stored ore now movable, it is believed the falling off in production, especially of the larger producers, will not be more than 25 per cent. for the first half of the year.

The large mills in the Parral camp have, with one or two exceptions, continued operating and are treating a normal tonnage. One exception is the San Francisco del Oro plant, which is shut down pending changes in metallurgical equipment. The mills at Guadalupe y Calvo are also in commission and the building of several new cyanide plants has been resumed. Several plants in the Guanacevi district have also started and late reports indicate that the tangled affairs of the Mexican Consolidated Mining and Smelting Company will shortly be in such shape as to permit of larger-scale and more systematic operations.

In western Chihuahua, the cyanide mills are unhampered in their operation. The Yoquivo plant, closed down April 1, is to be placed in operation shortly and at double its former capacity. The Concheño mill, near Ocampo, which has lately been completely remodeled, will also be put in commission soon. For the last 30 days the output of the Santa Eulalia camp has steadily decreased until it was only about one-fourth normal for the first twelve days of this month. The operators report a shortage of first-class Mexican labor, many of the *insurrectos* not having returned to work.

The Mining News

Reports of New Enterprises. New Machinery. Installations. Development Work and Property Transfers. The Current History of Mining

Alaska

The steamship "Northwestern" left Cordova, June 10, with 1100 tons of copper ore from the Bonanza and Latouch mines. The copper-ore exports for Alaska this year will far exceed any previous year in the history.

Slate Creek was the first placer camp discovered in the Copper River valley near Valdez, and is soon to be worked systematically with dredges. H. P. Hammond has a crew of men at work testing the ground with drills, and the results have been so encouraging that it is announced that a dredge will be installed next summer.

Mother Lode—This property in the Cordova district is being examined by Herman A. Keller and Lewis A. Levensaler, mining engineers, with a view of equipping it with modern machinery. This is a copper property and is thought to contain the same deposit as the Bonanza.

Alaska-Mexican—For the month ended May 15, the full mill of 120 stamps crushed 15,936 tons, yielding $43,161 gross and net $12,283. Operating expenses were $28,273; construction, $2604. The ore averaged $2.77 per ton.

Alabama

Jefferson County

The Ensley steel plant and rail mill of the Tennessee Coal, Iron and Railroad Company started up June 16, after a shutdown of six weeks. To supply this plant Pratt No. 8 coal mine, at Wylam, was started up June 9. The company has also blown in 375 coke ovens in the Pratt field and 100 at Bessemer. No. 5 furnace at Ensley, which has been relined, is nearly ready and will go into blast early in July, making basic pig, probably.

Arizona

Cochise County

Copper Belle—An item regarding this company was published in the JOURNAL of April 15 stating that the company might recover its property. The mine is at Gleeson and produced sulphide ore used by some of the Southwestern smelteries for flux. The facts seem to be that the property was sold under foreclosure to N. L. Amster in 1908. The redemption period expired without the property being redeemed. Minority stockholders are nevertheless soliciting funds to take the matter into the courts to recover title. Their attorney claims that former officials blocked an attempt to redeem the property and also saddled the company with alleged illegal obligations. The former officials, however, claim that the mortgages under which the property was foreclosed were of long standing, antedating their connection with the company, and that stockholders were duly notified of the impending loss of the property if funds were not forthcoming.

Gila County

Arizona Copper Company—This company has decided to proceed with the erection of new works, and in view of this plan Dr. L. D. Ricketts, general manager of the Cananea Consolidated Copper Company, has been appointed consulting engineer for a period of three years. Doctor Ricketts, who will be assisted by the company's general manager, Norman Carmichael, has been instructed to prepare the necessary plans and to submit them to the board of directors with as little delay as possible. It is expected that these plans will be before the board some time this autumn.

Maricopa County

A drilling rig has been shipped to Phœnix and the Northern Arizona Oil Company will begin drilling for oil within two or three miles of the city.

Mohave County

Gold Road—It is reported that negotiations by the United States Smelting, Refining and Mining Company to purchase this property have been concluded and that $1,400,000 is the purchase price.

California

Amador County

Kennedy—The shaft is down 3550 ft., including the 100-ft. sump. Ore is extracted from the 10 lower levels, the vein varying from 5 to 12 ft. in width, the oreshoots 500 to 600 ft. long.

Alpine—In reopening this mine at Plymouth, the bottom of the 600-ft. shaft has been reached; much retimbering was necessary. A mill has been leased for 60 days for test runs; if returns warrant, a 10- or 20-stamp mill will be installed. F. Henry, superintendent.

Argonaut—A new powder house is being built. It is of concrete, 30x15 ft., and 15 ft. high.

Fresno County

M. & M.—A 12-h.p. gas engine, hoist, and Sullivan drill are being installed at this mine, near Dunlap.

Humboldt County

Corona de Oro—This hydraulic property, on the line of Trinity county, near Trinity river, has been prospected and developed sufficiently to warrant the installation of giants, which will be operated under 500-ft. head. The ditch lines have been surveyed and the surface improvements are being made. A sawmill is in operation and an electric-lighting plant will be installed. W. E. Olmstead, Eureka, manager.

Inyo County

It is reported that the project for the development of the nitrate deposits at the foot of Slate range, in Panamint valley, has been abandoned as a result of an adverse report.

Kern County

Wedge—This mine, adjoining the Butte and Kenyon, has been leased to Burke and Buys, who report good ore below the 200-ft. level. Consolidated Mining Company, owner.

Stringer Gravel Company—The option of purchase of this company's placer claims between Randsburg and Atolia expired June 8, after the ground had been carefully examined for dredging. It is reported that the difficulty of separating the tungsten from the gold and the high cost of power caused the abandonment of the undertaking. The value of the ground both in tungsten and gold is not disputed. The Graham syndicate has since inspected the property.

Nevada County

Fruitvale—The face of the tunnel at this mine, at Moores Flat, is 550 ft. from the portal. The vein matter has widened so that both walls have been lost. If workable ore is discovered, a mill will be built. Andrew Fitzgerald, superintendent.

Gold Cañon—The five-stamp mill is now running on ore accumulated during development work. The shaft, which is 135 ft. deep, is being unwatered, and drifting may be done from the bottom.

Delhi—Unless the flumes and ditches of the Northern Water and Power Company shall be soon repaired, this and other mines at North Columbia will be obliged to close. It is reported that the water company does not intend to repair the damages that resulted from the storms of last winter.

Zeibright—The 10-stamp mill on this mine, in Bear valley, has been running all winter on good ore. Frederick Searls, Nevada City, president.

PLUMAS COUNTY

Mother Lode Mining and Reduction—The construction of the new 150-ton cyanide plant by this company at the foot of Indian valley is completed. The mill tailings of this and the Green Mountain mines will be treated. George M. White, Crescent Mills, superintendent of cyanide plant.

Bushman—Driving a drain tunnel has been decided as the only practical method for drawing the water from these placer claims, situated between American and Butterfly valleys; pumps have proven inadequate. Capt. Henry Adams, Quincy, owner.

SIERRA COUNTY

Tightner—Air drills, electric-driven compressor plant and other machinery are being installed for facilitating the examination of this mine, at Alleghany, on which J. M. O'Brien, of San Francisco, has a purchase option. H. L. Johnson, owner.

Standard—Two air drills will be installed at this mine in Sailors ravine, near Downieville. Jason Frye, owner.

Independence—A five-stamp mill, to be built by Robert Hathaway, at Grass Valley, will be installed at this mine, on Wolf Creek, near the Plumbago mine.

TEHAMA COUNTY

Northern California Gold Mining Company—The gravel beds owned by this company, at Jelly ferry, north of Red Bluff, on Sacramento river, are being prospected and examined to decide whether they can be more economically operated with a dredge than with a steam shovel, as at first planned. The area of the property is 270 acres; some platinum is reported as occurring with the gold.

YUBA COUNTY

Yuba Consolidated—The last load of parts for the 125-ft. digging ladder of dredge No. 13 arrived at Hammonton field, June 11. Upon completing the assembling and placing of the ladder, the dredge will be ready for commission.

Colorado

CLEAR CREEK COUNTY

At Idaho Springs, the water level has been lowered in the Stanley shaft to the sixth level; the fifth level is being retimbered and prepared for mining. There are large reserves of ore in the level and the stopes will be ready for mining as soon as track and air pipe are repaired. The regular output of from two to three cars of smelting ore per week is being mined from the third-level stopes and the mill is running steadily.

Clinton—Extensive development work is being done. J. H. Shoemaker, general manager, states that shipments of high-grade ore will commence as soon as the roads are in condition.

Centennial—The transfer of this mine will be effected within two weeks. David Kennedy, owner, is in New York, and capital has been pledged with which to close the transaction. It is stated that $125,000 was paid.

Capital—Leasers on the East Aetna drift have cut a body of smelting ore, and a wider vein of excellent milling ore.

Bellman—Shipments of 75 to 100 tons of smelting ore are being made weekly. The ore is uniform in grade and contains gold, silver and copper. The mine is opened to a depth of about 2500 ft. on the dip of the vein.

LAKE COUNTY—LEADVILLE

The drift being run below the Yak tunnel level, from Resurrection No. 2 shaft toward the Diamond orebodies, near the head of Big Evans gulch, is now within 150 ft. of its destination. When the Diamond was last worked, several years ago, sulphide ore was opened, but the high cost of pumping prohibited mining. When the orebodies are reached, the Yak company will be able to move the ore at a profit.

Luema Mining Company—The Valley shaft in South Evans gulch, was deepened by 200 ft. some time ago; since then stations have been cut at the 500- and 600-ft. levels, and drifts extended to the vein. The vein was reached recently and the value of the ore found to be the same as in the levels above.

New Monarch Mining Company—During May 150 cars of ore from the Cleveland and New Monarch claims were shipped. This is the largest shipment from these properties for a number of years.

PITKIN COUNTY

Smuggler—The company has changed from steam to electric power for hoisting and pumping. The battery of three electric pumps recently installed is doing good work. Two of the pumps are at present handling the water. The electric hoist is driven by two motors of 65 h.p. each. It is stated the hoist will be run at a speed that will bring the cage from the 1200-ft. level in one minute.

SAN JUAN DISTRICT

Frank Hough—At a meeting of the stockholders at Denver, it was decided to rebuild the shaft house and other buildings that were destroyed by fire, and continue operating.

Barstow—The mill is the property of the Standard Oil interests. Men are working on the roads to put them in condition for hauling concentrates by teams. The mill, which has been idle for several years, was opened last summer under the management of Mr. Wilfley, of Denver.

Koehler Tunnel—The number of men working in this tunnel is being increased.

TELLER COUNTY—CRIPPLE CREEK

Forest Queen—Deepening the Queen shaft on Iron Clad hill another 100 ft. is being considered. The shaft is 640 ft. deep and by going another 100 ft. the orebodies above can be mined.

Vindicator—The output from No. 1 shaft for May was 52 cars of ore. This is the usual production from the main shaft of this Bull hill property, but raising ore has been delayed because the shaft has been deepened. The shaft is now below the 1500-ft. level. The long drift on the 14th level has reached a point directly under the Hill City shaft.

Prince Albert—From a recent strike, five carloads of rich ore have been shipped. The ore is in phonolite, an unusual occurrence on Beacon hill.

Isabella—After spending two months in repairing the Isabella mill, the Western Reduction Company has the plant in operation. Mr. Hess, local manager, says that the capacity is 27,000 tons per month; that 10,000 tons will be treated at first, but which will soon be increased to 20,000 tons per month. He expects to make $1.20 to $1.40 per ton net.

C. K & N.—At the annual meeting of the stockholders, which will be held in New York city, action will be taken on the starting up of the property. According to one of the leading stockholders, the company will take the property and work it on its own account.

Idaho

COEUR D'ALENE DISTRICT

Hecla—This company paid its 96th dividend in June, the amount being $20,000, at the rate of 2c. per share. To date, the company has paid $2,200,000 in dividends, which is nearly nine times the par value of its stock.

Kendall—The Kendall's 79th dividend, at the rate of 2c. per share, was paid during June. This makes a total of $1,385,000 paid in dividends up to the present time.

Carbonate Hill—Good milling ore has appeared in the face of the tunnel. It is planned soon to crosscut the ledge from wall to wall. The workings are now at a depth of 800 ft. from surface.

Illinois

Coal Operators' Association of the Fifth and Ninth Districts—This association has elected the following officers: President, R. W. Ropiequet; vice-president, Thomas T. Brewster; secretary, F. F. Tirre; treasurer, J. E. Yoch; executive committee, E. C. Donk, P. M. Hucke, D. F. Cameron, Thomas Jeremiah, Louis F. Lumaghi, Otto Michaelis, J. P. Reese and J. E. Rutledge. These districts are in southern Illinois, largely supplying the St. Louis market.

Indiana

Clay County

Bee Ridge—After being shut down for a few months while this company of Brazil, Ind., was constructing its switch from the railroad to the mines, the company's mine resumed operation June 14. The company has a number of important contracts, and indications point to steady work. The mine, though productive, has worked under the disadvantage of being a wagon mine, but it has now been converted into a railroad mine of importance. The company has a large tract of coal land on which is found some fine block coal. A reorganization has just been effected with W. E. Eppert as president and A. T. Spears secretary.

Greene County

Black Creek—This mine, three miles east of Linton, has resumed operations. The property has been shut down for seven months on account of a fire that destroyed the tipple and all the buildings.

Sullivan County

Monon Coal Company—Suit has been filed against John Bludgett and other land owners of Sullivan county to perfect the title to the John R. Walsh property in this county. The body of land amounts to more than 12,000 acres, and was recently transferred by the Alliance Coal Company to the Monon company.

Vigo County

The Indiana Bituminous Coal Operators' Association held a meeting at Terre Haute and indorsed the action on the strike at the Little and Wabash mines and voted assistance to the companies whose mines are closed. The members of the association assert that the miners are not living up to the contract and that their demands in the strike question were not in accordance with the contract.

Kansas

Eastern Lead and Zinc—This company, operating at Lawton, has started the mill.

Maggie Taylor—C. C. Playter has taken over the Maggie Taylor lease at Galena, including the Nymo mine.

Michigan

Copper

Houghton Copper—The shaft going down in the footwall has reached a depth of over 400 ft., but the ground has been badly broken so that it was not advisable to crosscut to the lode. A drill core was taken from the lode at a depth of 450 ft. and if the character of the ground will permit, it may be decided to start the first crosscut to the lode at that point.

South Lake—The company has decided to begin shaft sinking as soon as possible and ground will be broken in the near future. D. C. Forbes, who will be in charge of operations, has returned to the property after a conference with the Eastern office at Boston. It has been shown by a series of drill holes that four copper-bearing lodes traverse the tract and in sinking the shaft other lodes very likely will be encountered, the latter having been exposed on adjoining lands and their trend being toward this property.

Adventure—The company has suspended sinking operations temporarily at its new vertical shaft and is crosscutting to cut the two lodes exposed in the shaft. Drifting is to be started as soon as the lodes are reached and they are to be opened up as quickly as possible.

Keweenaw—At a meeting of the directors held recently, Thomas F. Cole was elected president, succeeding the late C. A. Wright.

Isle Royale—This company has begun the unwatering of the old Huron workings that have been abandoned for a number of years.

Marquette Iron Range

Cleveland Cliffs—The company has established a mine-rescue station on the Marquette range. Equipment including a supply of oxygen helmets and a number of large oxygen tanks has been purchased. Picked crews of men are being trained at the various mines, in the use of the apparatus.

Menominee Iron Range

Baker—The mine formerly operated by Corrigan, McKinney & Co., has been abandoned and is being dismantled. It is not known whether the suspension of operations was caused by the character of the ore or by differences between the fee owners and the operators. Considerable underground work had been accomplished.

Traders—As soon as the water can be pumped out, this mine will resume operations. Orders have been received to ship 100,000 tons of ore this season.

Minnesota

Cuyuna Range

Cuyuna-Mille Lacs—The company is meeting with encouraging results in its drilling on S 3-T 46-R 29. The company has drilled seven holes on this tract, all of which went into iron. The last hole struck commercial ore at a depth of 52 ft. and at 400 ft. the drill was still in ore. It is reported that another drill is to be started immediately.

Mesago—The Iron Mountain Company has six holes bottomed in ore. The land, S 33-T 47-R 29, is held under lease by this operating company, from the Gorham-Garbett Company. In one of the holes the ore was first encountered at a depth of 330 ft. and at 590 ft. the drill was still in the ore, making 260 feet of formation at that depth.

Vermilion Range

Duluth-Vermilion—This company owns the John Bisbee property in S 7-T 62-R 13, consisting of about 170 acres including riparian rights on Robinson lake. One drill is working and several hundred feet of drilling has been done.

Tower Mining and Development—The company is exploring the John Smith property in S 9-T 62-R 13. No official news has been given out yet.

Section 30 Development—This company is exploring the Dave Adams homestead and the shaft is down 30 ft. A hoisting plant has been installed and a four-drill air compressor is now being put into commission.

McCue—This mine is one of the Kennedy properties in S 10-T 62-R 14. Drilling is being done, and the third hole is down 600 ft. This hole will be followed by a working shaft.

Missouri

Newburg Tripoli Company—This company has begun to work a deposit of tripoli, near Newburg. Machinery is being put in to grind and prepare for market 24 tons a day. L. M. Finney, St. Louis, is president.

Kramer—This company, operating at Cave Springs, has 1200 tons of ore in the bins, which it is holding for higher prices.

Katy—The company operating the west 10 acres at Thoms Station, has started the mill. It has about $6000 worth of ore on the dumps.

Modoc—This Chapman & Lennan company has started its mill at Thoms Station. The dirt is proving as rich as any in the camp.

Montana

Butte District

East Butte—Several important improvements are being made which, when completed, will effect a reduction in operating expenses. A new and modern dust chamber, which will be ready for use in three or four months, is under construction. It has a length of 300 ft., a width of 50 ft. and contains three flues. As soon as this is put in operation, the copper dust, formerly lost through the stacks, will be saved by precipitation. The old tailings dump, which is estimated to be worth $500,000, is to be reworked and a slime pond is being constructed for the purpose. These important improvements will increase earnings to the extent of $8000 per month.

Ophir—A strike of silver ore was recently made on the 200-ft. level of this mine of the Butte Central Copper Company, in a part of the mine which was supposed to be barren. This ore is now being mined and shipped. The erection of a small concentrator as a preliminary plant, so constructed as to admit of enlargement with increased demand, is shortly to be commenced. A station has

been cut on the 800-ft. level and sinking the shaft to the 1000-ft. level resumed.

Alex Scott—On the 600-ft. level a new vein has been opened. One or two cars of ore are being shipped daily to the East Butte smeltery, the returns being more than enough to meet all operating expenses. The new shaft of the Little Annie claim of this company has now been sunk to a depth of a little over 100 feet.

BEAVERHEAD COUNTY

Butte & Vipond—Application has been made by the Butte & Vipond Gold Mining Company for listing its shares on the New York Curb. The company was incorporated May 19, 1910, with a capitalization of 600,000 shares, par $1, and of this amount, 200,000 shares are in the treasury. The officers and directors are: Thomas P. Manley, president; William S. Freiday, vice-president; M. A. Bornholdt, secretary and treasurer, and A. C. Reid. The company owns a gold-silver-lead mine, near Dillon, Montana.

GALLATIN COUNTY

West Fork—The recent discovery of placer gold in the West Gallatin basin, near Bozeman, has caused a rush of prospectors to the region and the valley has been staked for several miles along the river bottom. The West Fork Mining Company, of Livingston, is installing a hydraulic plant on several of its claims, and has eight men at work. The company expects to begin sluicing within two weeks, when the force of men will be augmented.

GRANITE COUNTY

Mt. Royal—At this group of mines, near Phillipsburg, a new vein of gold and silver ore, lying parallel to and 125 ft. distant from the main vein, has just been opened. A 50-ton mill is being built, which is expected to be in operation within two months.

LINCOLN COUNTY

Snowshoe—The Pacific Coast Smelting and Refining Company, owner of the Snowshoe mine, near Libby, has just purchased three claims adjoining the Snowshoe mine on the south, which gives to the company over 1.5 miles on the Snowshoe vein. Work is being carried on steadily in sinking the shaft from the 400-ft. level, and the concentrator has been in operation for some time. W. H. Graham, O. W. Nicholson and F. L. Bice, of San Francisco, are interested.

Silver Cable—Butte people are having an inspection made of this mine, near Libby, with the object of taking over the property if a favorable report is rendered. The ore contains silver, lead and some gold. Several years ago a 50-ton concentrator was built, but the mine has never been worked since its completion.

MISSOULA COUNTY

Iron Mountain—Ore shipments to the East Helena smeltery have been resumed. The ore contains silver and lead, and is sorted as fast as mined, the shipping ore being sent to the smeltery, and the concentrating ore stored in the stock pile which now contains over 5000 tons. Prospecting has proved that in addition to silver-lead ore, the mine contains considerable zinc ore. The company plans to fully develop this ore, and to install several McQuisten tubes for its concentration, the mill having been remodeled for the purpose.

Nevada

HUMBOLDT COUNTY

Ohio—A mill that will cost $125,000 is to be erected as designed by J. B. Fleming.

West Dip—This mine, east of Golconda, is being actively developed. A compressor and drills were lately installed.

Kramer Hill—This gold mine, near Golconda, is to be equipped with a 10-stamp mill to be used in determining the proper design for a larger mill. This is a low-grade deposit.

STOREY COUNTY

Con Virginia—Connection has been made on the 2450 level of the west crosscut from the south drift with the northeast drift from the shaft giving complete ventilation to the north through the Ophir winze so prospecting may be done on this level under tolerable working conditions.

Ward Shaft—A 6-ft. concrete bulkhead has been finished on the 2000 level in the Gold hill drainage drift. Diamond-drill holes will tap the water in the old workings and the flow through the bulkhead will be controlled by valves.

C. & C.—Removing sections of the old Cornish pump in the sump below the 2650 station is now under way. Electric pumps will be installed on this level before sinking and unwatering the north end to the 3000 level.

Mexican—Five cars of first-class ore shipped the second week of June returned $13,615 to the company.

WHITE PINE COUNTY

Giroux—A strike of high-grade copper ore is reported on the 1200-ft. level of the Giroux shaft, in the north crosscut to the Alpha shaft. It is supposed to be a continuation of the Alpha orebody. Much water is encountered in the lower levels.

New Mexico

GRANT COUNTY

Azure—The company has recently encountered some fine turquoise matrix in the third level of the new mine. This mine has been operating about three years and is 1000 ft. east of the old mine, which has been worked extensively for the last 20 years. The turquoise occurs in veinlets throughout the mass, in a fracture zone in monzonite porphyry.

Indian Pink—This company, operating at Bald mountain, has the shaft down to the 100-ft. level, and so far almost continuously in silver-chloride ore.

Oregon

BAKER COUNTY

Red Boy—Preparations are being made by J. Farrell, manager, Sumpter, to start the stamp mill on this property.

Ben Harrison—A contract has been let to W. H. Schwaderer for the driving of several tunnels on this property.

Stelter—The stamp mill on this property is working successfully on ore from a 9-ft. vein. John Reese, Sumpter, has charge.

JOSEPHINE COUNTY

R. M. Wilson, Grant's Pass, is considering the erection of a 40-ton custom mill on Josephine creek, near Kerby, to treat the ores from the different mines in that section.

Oriole—The company is considering the purchase of a stamp mill and cyanide machinery. Fayette Jones, Grant's Pass, has charge.

Golden Drift—The new machinery for the power plant has arrived and will be installed at once. The property is being operated by the Chicago-Rogue River Company. George Sanders, Grant's Pass, manager.

South Carolina

A tract of 1900 acres in Lancaster county has been sold to John T. Stevens, Kershaw, S. C. Work is to be begun at once on development of this property, which was worked as a gold placer several years ago.

Utah

JUAB COUNTY

Tintic shipments for the week ended June 16 amounted to 157 cars, including one car of slag from the Tintic smeltery and one car of concentrates from the May Day mill.

Crown Point—At the annual meeting, June 5, it was stated that 400 ft. of work had been done on the new shaft, which has been timbered all the way. On May 1, 1911, there was $1348 cash on hand. During the year 112,900 shares of treasury stock were sold, which brought $6532. The equipment was moved from the old to the new shaft and 3500 ft. of new road was built.

Eagle & Blue Bell—Shipments during May totaled six cars, averaging about $18 per ton in gold, silver and lead. During June these will be increased. Samples have been taken recently in the winze below the 1200, which ran especially high in silver, and it is thought possible that at the 1300 a continuation of the Victoria ore zone may be found.

Gold Chain—The orebody on the 400 level has been drifted on for 200 ft., the average width being about 15 ft. The ore

as broken is stated to run in the neighborhood of $20 per ton. New hoisting equipment is on the way to the property. During the last week eight carloads were shipped. A new 5-in. air line will be laid between the compressor plant and the hoist.

Uncle Sam Consolidated—At the annual meeting, June 5, the year's ore shipments were given at 9894 tons, which brought $202,827, or about $20.50 per ton. The total receipts were $215,063; disbursements and mine expense, $82,-312; dividends, $70,000; leaving cash on hand, $62,751. The net profit for the year was $120,515. Work is being done on three separate orebodies.

King William—The survey of the Grand Central workings has been completed and it is reported that development will shortly be resumed.

Opex—Work is being done on the 1400,- 1600- and 2200-ft. levels. An assessment of 2c. per share has been called.

Black Jack—Work is being done on the 200-ft. level, northeast of the shaft, and every effort is being made to prospect the ground thoroughly. Leasers are working at the south end of the claims, and are making shipments. An offer was made recently to lease the Black Jack dump, but was refused. It is reported that the Jesse Knight interests still have in mind the erection of a cyanide plant at Tintic, to treat some of the dumps and other low-grade ores.

United Tintic—Preparations are being made to sink the shaft to the 325-ft. level and to explore the Aspenwall and Bullock veins. A Cameron sinking pump has been installed.

Old Colony & Eureka—This group of claims, west of the Black Jack ana south of the Lower Mammoth, has been leased for one year to Eureka men.

Bradley—Work has been temporarily suspended at this property in North Tintic. An option is held by Salt Lake and Eastern interests.

South Scranton—Work has been suspended at this property. The tunnel is in 150 feet.

Lower Mammoth—The last annual report showed that 4420 ft. of development had been done during the year. Work on company account has been suspended, and the property at present is being operated by leasers.

Lehi-Tintic—The tunnel is in 450 ft., and two shifts are being worked. About 4 ft. of progress is being made daily. A fissure in limestone is being followed. George Nichols is manager.

East Crown Point—An accident to the engine, May 28, caused a three-day shutdown, after which shaft sinking was resumed. The present depth is about 340 ft. John Lewis is in charge of the work.

Sioux Consolidated—The work of sinking is about completed. A station will be cut and drifting started shortly, after which shipments will be resumed.

Susan—Frank Thornberg has obtained a renewal of his lease on this property, near Silver City. About $13,000 worth of ore is reported to have been shipped during the last year.

Dragon Consolidated—The east drift on the 800-ft. level has cut what is thought to be the Iron Blossom fissuring, which is being followed toward the west. The fissuring carries some quartz with a small amount of galena. The drift on the 1000-ft. level will cut the same vein in the next few weeks, and drifting for this vein is being done on the 300 level.

Salt Lake County

Bingham Mines—A statement of the company's affairs, issued Dec. 31, 1910, shows assets as follows: Real estate and mines, valued at $1,312,737; construction and equipment, $194,200; merchandise, $26,544; cash and debts receivable, $128,812; prepaid insurance, $594; mining stocks, $485,613; sinking fund, $176; total, $2,148,676. Liabilities: Capital stock, $945,560; accounts payable, $352; floating indebtedness, $47,-439; funded indebtedness, first-mortgage bonds, $577,790; accrued interest, $8535; total, $2,148,676.

Burro—This property, in Mill Creek cañon, near Bountiful, is reported to be ready to ship. It is proposed to build a tram line from the mine to the bottom of the cañon, where ore will be loaded on wagons.

Columbus Extension—The west raise is up over 110 ft. above the tunnel level on ore, which has maintained its width and grade. A level was started at the 100-ft. point, and drifting on ore both ways is being done.

Columbus Consolidated—At the annual meeting, June 6, the control of the company passed from McCornick-Jacobson interests for the first time in its history. The new interests, or so called insurgents, were led by C. H. Gibbs, L. A. Jeffs and W. L. Maas, backed by Michigan interests.

Utah Consolidated—The drift on the 200-ft. level has been driven 125 ft. north of the shaft, and is in the limestone in which orebodies occur in this neighborhood.

Utah Mines Coalition—Ore has been followed on the tunnel level for about 230 ft., and in places runs well in silver. A good face of silver-lead ore is exposed. Arrangements are being made for hauling to the samplers in Salt Lake Valley, and shipments will shortly be started.

Summit County

Silver King Coalition—At the annual meeting held in Salt Lake City, May 15, D. W. Keith, Thomas Kearns, W. S. McCornick, James Ivers, J. S. Bransford, W. V. Rice, W. Mont Ferry, J. Frank Judge and M. C. Fox were reëlected directors. David Keith is president, F. J. Westcott, secretary. Arrangements are being made to raise the million-dollar bond required by the recent judgment obtained against the company by the Silver King Consolidated.

Daly-Judge—At the annual meeting held in Jersey City, H. Otto Hanke, Moylan C. Fox, G. W. Lambourne, with W. M. Bradley, and A. C. Wall, were reelected directors. Mr. Hanke was elected president.

Virginia

A tract of 360 acres of land containing mica deposits, near Axton, has been bought by a new concern, the George K. Cooper Mica Mining and Manufacturing Company. Development work is to be begun at once. P. J. Boelte, Danville, Va., is president.

The lease of the Oriskany Ore and Iron Company, of which W. W. Taylor is general manager, on the Buena Vista, Iron Gate, and Shenandoah, Va., blast furnaces and ore mines at the Oriskany property of the Alleghany Ore and Iron Company, a subsidiary of the Lukens Iron and Steel Company, Coatesville, Penn., will expire the latter part of June. The property will be taken over by the Alleghany company and the Iron Gate furnace operated; but the lease on the Buena Vista property has been extended four months to allow the Oriskany company to work up the ore on hand, when the furnace will revert to the owners.

Washington

Ferry County

Gem—An engine and other machinery have been ordered for this property on Toulon mountain. H. W. Working, Orient, has charge.

Rathbon Reduction Works—Operations have been resumed at this mill, after a shutdown for installing machinery.

Shepard-Montana—Development will be started on this property, near Orient, at once, and will be carried on throughout the summer.

Kettle River—Work will be resumed on this property at Rock Cut. The shaft is now in galena, which will be treated in the 50-ton concentrator at the mine.

Republic County

Bonanza—Considerable work has been done on this property by George Taylor and L. M. Fluent, of Harlinda. They expect to begin shipping soon.

Knob Hill—The smelter returns from a carload of ore from this property, near Republic, gave a gross assay value of $133.47 per ton.

Lone Pine—Good ore is being mined from this property, controlled by the Republic Mines Corporation, Republic.

Golden Crown—This property is being worked this season by David Campbell and Robert Elli, Harlinda.

SNOHOMISH COUNTY

Apache—This gold and silver property has been leased for two years to Miller & Hoyt, of Everett, who are making preparations for a shipment of ore to the Tacoma smeltery.

WHATCOM COUNTY

As a result of a rush of prospectors to Lightning creek, on the headwaters of the Skagit river, where a rich strike was made by Jack Rawson, the forestry officials have doubled the force of guards and rangers.

Wisconsin

Vinegar Hill—This company has taken over the management of the Mound City property under a 30-day option.

Field—The company is moving its 75-ton mill to the Crawhall lease six miles southeast of Benton.

Wisconsin Metals—This company is constructing a double-cylinder roaster at Benton and will engage in custom roasting.

Rowley—A 75-ton mill is under construction by the Vinegar Hill Zinc Company. The old mine workings have been reopened and a large tract of new ground proved by churn drill.

Peaceful Valley—This company will build a roaster at its property two miles east of Elmo. Mine run of sulphur ore is shipped direct from the mine to the Grasselli Chemical Company.

Canada

BRITISH COLUMBIA

Monarch—This mine, a silver-lead-zinc property, two miles east of Field on the main line of the Canadian Pacific Railroad has been reopened. The mine, which is the oldest in the province, was discovered when the railroad was being constructed through the mountains and is controlled by a Vancouver syndicate. Mr. J. A. Thomson is managing director and H. H. Lavery is superintendent.

Granby—Mining and smelting were resumed at the property in the Boundary district about the middle of June, after a shutdown of nearly four weeks, due to a shortage of coke and coal.

Hedley—The tonnage of ore put through the 40-stamp mill at Hedley, during May, was 5095 tons, the largest quantity for any month since operations were commenced. The tonnage for five months ended May 31 was 22,244 tons, as compared with 15,915 tons for the corresponding period of 1910. The increase is largely due to the use of a tube mill and other additions to plant, the full benefit of which was only lately obtained. No gold is now saved on amalgamation plates, the gold being extracted from the ore by concentration and cyanidation—approximately 75 per cent. of the total recovery by the former and 25 per cent. by the latter process.

Osoyoos Coal—Fully 60 ft. of lignite much of it of good quality, has been cut in this company's newly opened mine, near Princeton.

NOVA SCOTIA

Eastern Coal Company—An order for the foreclosure of the property in Cumberland county has been obtained by the National Trust Company, trustees, under a mortgage for $250,000.

ONTARIO—COBALT

The shipments from Cobalt for the week ended June 16 were: Cobalt Lake, 249,920 lb.; Nipissing, 245,350; McKinley-Darragh, 116,040; Temiskaming, 85,550; La Rose, 85,540; O'Brien, 65,250; Trethewey, 64,210; Chambers-Ferland, 64,000; Coniagas, 63,160; Buffalo, 61,690; Right of Way, 60,100; Kerr Lake, 60,100; Hargraves, 60,000; Colonial, 46,000; total, 1,326,910 pounds.

Little Nipissing—Since the new directors took charge, liabilities have been reduced from $22,000 to $6000, and it begins to look as though shareholders might get some returns for their money. Thus far only about 1,000,000 shares have been sent in for transfer and the time for transfer expires August 24.

Cobalt Central—The sale of this property has again been adjourned till June 27. None of the bids were satisfactory, a reserve price of $100,000 having been put on it.

Wettlaufer—It is understood that the directors of this company, operating in South Lorrain, will soon declare a dividend of 5 per cent.

Silver Leaf—The north shaft is down 465 ft. and will be continued until the Keewatin formation, which underlies the diabase, is reached.

Millerett—The 10-stamp mill is now crushing about 30 tons of ore per day at this Gowganda property, with a supply sufficient to last for some years. A shipment of 30 tons of high-grade ore, running about 2000 oz. per ton, extracted from the 150-ft. level, was recently made.

Bellellen—Ore has been struck at the 120-ft. level of this property in South Lorrain, the vein varying from 10 to 20 in. in width. A rich surface vein petered out after ore to the value of $15,000 had been extracted.

ONTARIO—PORCUPINE

The O'Donnell-Huddlestone syndicate, of Chicago, has closed options on 20 properties in Cody township. They lie in a direct line with the conglomerate belt, running through the Three Nations Lake area in Whitney. About $7000 has been spent on development work by the former owners, in putting down a shaft 40 ft., test-pitting and trenching.

Vipond—The second vein has been cut at the 100-ft. level. The one-stamp Nissen mill is turning out about $1000 per month, the total output to date being between $6000 and $7000. A 10-stamp mill will soon be installed. On one vein a drift 420 ft. long has been opened at the 100-ft. level, showing a high-grade streak about 2 ft. wide.

Hurd—A strike of free gold has been made on this Swastika property, owned by G. M. Hurd, of Philadelphia. The vein is from 12 to 18 in. wide.

Hollinger—Sovereigns to the value of $55,000 have just been issued at the Ottawa mint from gold received from this property.

Rea—The main shaft is down 240 ft., the greatest depth of any in the camp, and drifting has been started at that level. The quartz in the bottom carries free gold in the pay streaks.

Leslie-Derry—A syndicate of Goldfield, Nev., capitalists, headed by Sen. W. F. Heffernan, has purchased the Leslie and Derry claims in northern Tisdale, and will organize a company.

Pearl Lake—Two sampling stamps, a 20-drill compressor plant and electrical machinery will be installed. Power will be secured from Sandy Falls.

North Dome—A new discovery of free gold has been made on this property at a depth of 33 ft. in the shaft.

McIntyre—New machinery will shortly be installed on this property.

QUEBEC

McDonald—This mine at Weddon has developed the orebody by drills at a depth of 200 ft. below the present bottom of the shaft, the depth of the latter being 110 ft. Leland D. Adams is in charge.

Mexico

CHIHUAHUA

National Mines and Smelter—New pumps have been placed in the mine and many improvements made in the mill. Ore has been piled at surface pending starting of the mill.

Alvarado—At a recent meeting the directors determined to carry out extensive developments at the mines and build another tramway for transporting ore from the Veta Colorada group to the cyanide plant.

Santo Domingo—A recent cloudburst at Santa Eulalia camp damaged this and the Gasolina mine to such an extent that $20,000 will barely replace the buildings and equipment destroyed.

SONORA

Calumet & Sonora—Machinery for the zinc-separation mill is being received from the Huff Electrostatic Company. The mill will probably be ready for operating early in July.

The Markets

Coal Trade Review

New York, June 28—The coal trade in the West is still in a more hopeful mood, though business seems to improve rather slowly. The general impression is that consumers are carrying no stocks, and any improvement in trade must be followed by a demand for coal. Meantime mines are working at an average of about 60 per cent. of capacity.

The Lake trade is improving and shipments from the lower ports are fairly active, promising a good total for the season.

The seaboard bituminous trade is also more cheerful, though the actual improvement in business is not large. Export trade is better than for some time past.

The anthracite trade has settled down into its summer routine, and collieries are taking the July 4 holiday by a week's stoppage.

Coal Traffic Notes

Coal shipments over Norfolk & Western railway, 11 months of fiscal year from July 1 to May 31, short tons:

District:	Commercial	Company	Total
Pocahontas	9,486,963	989,839	10,476,802
Tug River	1,422,134	444,704	1,866,838
Thacker	1,383,636	567,180	1,950,816
Kenova	680,420	135,956	816,376
Clinch Valley	983,716	63,481	1,047,197
Total	13,956,869	2,201,160	16,158,029

The total shows an increase over the previous year of 1,391,604 tons, or 9.4 per cent.

Bituminous-coal and coke tonnage of leading railroads in Pennsylvania and West Virginia, four months ended April 30, short tons:

	Bituminous	Coke	Total
Pennsylvania	13,303,935	3,639,874	16,943,809
Balt. & Ohio	8,653,948	1,277,542	9,931,490
Buff., Roch. & Pitts.	2,447,977	146,636	2,594,613
Buff. & Susqueh'na	548,264	102,777	651,041
Penn. lines, N. Y. C.	2,686,192	29,113	2,715,305
Pitts. & L. Erie	2,673,402	1,778,236	4,451,638
Pitts., Shawmut & N.	452,909	7,761	460,670
Norfolk & Western	5,466,929	629,961	6,096,890
Ches. & Ohio	4,812,827	57,259	4,870,086
Virginian	766,086	.....	766,086
Total	41,812,469	7,669,159	49,481,628
Total, 1910	43,101,049	10,728,988	53,830,037

Decrease in coal this year, 1,288,580 tons, or 3 per cent.; in coke, 3,059,829 tons, or 28.1 per cent.; total decrease, 4,348,409 tons, or 8.1 per cent. The Virginian does not report coke tonnage separately. Anthracite tonnages of Pennsylvania and of Baltimore & Ohio are given elsewhere.

New York

Anthracite

June 28—Trade in domestic sizes is on the summer basis, and all the companies are sending some coal to the big storage yards. The Reading will close down its collieries for the first week in July, and all the other companies will close for several days next week, over the July 4 holiday.

On Saturday of this week—July 1—there will be 10c. more taken off the summer discounts, making the schedule for July $4.55 for lump, $4.80 for egg and stove, and $5.05 for chestnut; all f.o.b. New York harbor. On steam sizes quotations are: Pea, $3@3.25; buckwheat, $2.30@2.75; No. 2 buckwheat or rice, $1.80@2.25; barley, $1.45@1.70; all according to quality, f.o.b. New York harbor.

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Bituminous

While there is no great improvement in actual sales, there is a better tone to the market. Large local and New England buyers are inquiring for coal. It is known that stocks in consumers' yards are generally low, and any improvement in business means more selling of coal. The mines are not shipping much beyond orders, and there is practically no free coal at tide to depress the market. The Lake trade is beginning to be felt, taking considerable coal from mines which usually ship to tide.

Prices show little change. A fair steam coal costs $2.50, f.o.b. New York harbor; lower grades sell down to $2.30 and better up to $2.85. Gas coals are rather firmer, bringing $1.10@1.15 for ¾-in., $1@1.05 for run-of-mine, and 70@80c. for slack, all at mines.

In the coastwise trade boats are in good supply and rates inclined to be easy, though nominally unchanged. From Norfolk, off-shore business is reported unusually good.

Birmingham

June 26—Coal operations in Alabama promise to pick up considerably during July. A number of orders for large quantities of coal have been secured lately but in the main the delivery is not to start until later. However, the operators are hopeful that some of the business on hand or in sight will be acceptable sooner than that and delivery may start in some instances during July. The output at the coal mines in Alabama is at a low mark at present.

Coal prices are reported off, some of the larger consumers demanding that a lower price be made them for the last half of this year. Contracts depend on the operators making concessions in prices on large consignments.

Coke is in better demand and during the coming week there will be resumption of operations at more than 200 coke ovens in the Birmingham district. The demand for coke on the open market shows some improvement.

The governor of Alabama has appointed the following State board of examiners for mine foremen: Erskine Ramsay, vice-president and chief engineer of the Pratt Consolidated Coal Company; Carr McCormack and W. B. Hillhouse, mine operators; J. H. Tidmore, miner; Tom Tinney, mine foreman at Blocton No. 7 mine of the Tennessee company. The State mine inspector, C. H. Nesbitt, acts as chairman of the board.

Chicago

June 27—The coal market is in the midst of its normal summer dullness, with no active selling anywhere except in the harvesting fields, which have a brisk early demand for good qualities of coal. The favorite fuel for steam makers continues to be screenings, with the result that this size is firm in western coals. Domestic coals are dull, with consequent weakness in nearly all kinds. Western mines are restricting shipments so well that there is little forced selling, but prices are low through the great possibilities of increased supplies and seem hardly likely to rise for a long time. Illinois and Indiana mines are sending to this market only a small fraction of their capacity, with many mines closed and no prospect of their reopening before autumn.

On cars Illinois and Indiana bring $1.90@2.30 for lump, $1.65@1.85 for run-of-mine and $1.65@1.85 for screenings. The supply of all coals from east of Indiana is abundant and sales are light. Smokeless holds up with difficulty to the circular prices of $3.15 for run-of-mine and $3.55 for lump, Pocahontas and New River, on the sales most favorable to the mine agents, while in some cases these prices are cut 10@20c. Hocking is in light demand but steady at $3.15. Anthracite is sluggish and hardly likely to improve before autumn.

Cleveland

June 26—Lake trade is getting quite active. There are plenty of large vessels, but small boats, which can go into the smaller ports, are rather scarce.

Locally trade is quiet. Prices are un-

changed, except that the larger movement of Lake coal has made slack plentiful, and it can be had 5 or 10c. cheaper than last week. Pocahontas is scarce and hard to get at any price.

Indianapolis

June 26—Steam coal is looking up a little, but improves slowly. Mines generally continue to work on half or two-thirds time. The chief activity just now is—as it was last week—in the harvester trade, which promises to be very good this year, on account of the heavy crops in this State.

Pittsburg

June 27—Coal shipments in the Lake trade are a trifle heavier, though still below those of last year. The almost unprecedented position is presented of vessels taking coal up the Lakes and returning empty. Some are doing so simply because they made contracts to carry the coal and are doing so even though they do not get the expected ore cargoes in return, but there is also considerable wild tonnage being so placed, the vessels being fitted out and preferring to take up coal rather than do nothing. All this business is done at the season rate of 30c., this representing a large loss on account of the return trip being made without cargo. Local commercial demand continues light. Mines are running at about 60 per cent. of capacity. Prices of slack have yielded somewhat on account of heavier production due to Lake shipments, and as low as 60c. is done. Otherwise we quote prices unchanged: Nut, $1.05@1.15; mine-run, $1.10@1.15; ¾-in., $1.20@1.25; 1¼-in., $1.30@1.35; slack, 60@75c. per ton at mine.

Connellsville Coke—A sale of 5000 tons of furnace coke for July shipment was made last week at $1.50, but the prices can be shaded this week for similar delivery. A large merchant furnace interest has bought 9000 tons for July, while another interest has renewed a contract for 9000 tons a month during third quarter. Contracting for foundry coke for the twelvemonth beginning July 1 continues, prices varying according to grade and reputation of the coke. The business is being placed somewhat more slowly than usual in the contracting season. We continue to quote: Prompt furnace, $1.40@1.50; contract furnace, $1.75@1.85; prompt foundry, $1.90@2; contract foundry, $2@2.25 at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended June 17 at 271,088 tons, an increase of 4500 tons, and shipments at 3058 cars to Pittsburg, 4925 cars to points west and 480 cars to points east, a total of 8463 cars.

St. Louis

June 26—The coal market this week is, if anything, in a little bit worse condition than at any time this year, though coal men are inclined to think that it is now the "darkness just before the dawn," and that another two weeks will see a marked improvement. The slightly increased demand for lump and the shutting down of the Granite City Steel and several other large screening consumers have caused a slump in the price of screenings. Operators on the other hand have been unable to effect any advance in the price of lump, so consequently the mine-run price, which was already below cost, is even worse than ever.

The market on screenings has dropped to a point where it is weak, at 70c. per ton, at mine.

The feature of the week has been the letting of the contracts for the city water works and sanitarium, which amounts to about 75,000 tons a year. The contract was awarded to the Miller Coal and Coke Company, at $1.48 on lump coal and $1.21 on screenings, f.o.b. cars, St. Louis. This represents a price of 96c. per ton at the mines for 2-inch standard lump coal and 69c. on standard screenings. The price for lump is considered fair and the screenings price shows an advance over any preceding year.

The country trade is beginning to show some interest, as a number of inquiries have been received, though orders are light.

Current prices of coal in the St. Louis market are as follows:

Standard:	F.O.B. Mine	F.O.B. St. Louis
6-inch lump	$0.85	$1.27
2-inch lump	0.75	1.17
2-inch screenings	0.70	1.12
Mine run	0.75	1.17
2-inch nut	0.85	1.27
Staunton and Mt. Olive:		
6-inch lump	1.30	1.82
2-inch lump	1.25	1.77
2-inch screenings	0.75	1.17
2-inch nut	0.90	1.42
Carterville:		
6-inch lump or egg	1.15	1.82
3x2-inch nut	1.05	1.72
2-inch screenings	0.70	1.37
Trenton:		
6-inch lump or egg	1.75	2.27
3x2-inch nut	1.50	2.02
Franklin County:		
6-inch lump or egg	1.40	2.07
3x2-inch nut	1.20	1.87
Pennsylvania Anthracite:		
Chestnut		6.90
Stove or egg		6.65
Grate		6.40
West Virginia Smokeless:		
Lump or egg	1.90	4.40
Mine-run	1.10	3.60

East St. Louis prices are 20c. per ton lower on Illinois soft coal.

Anthracite—The situation is in better shape this year than any preceding year at this time. The tonnage moving is about normal, and up to date there has been no disposition on the part of shippers to crowd the market.

Calgary, Alberta

June 23—The miners' strike is still unsettled, and there seems to be no immediate prospect of its close. The coal situation is embarrassing, not only on account of the lack of present supplies, but because it will be impossible to accumulate stocks for the winter demand. Even if the strike should end at once, it would be some time before the mines could make any provision for the winter supply. The probable shortage is a serious question.

FOREIGN·COAL·TRADE

German Coal Trade—Exports and imports of fuel in Germany, four months ended April 30, metric tons:

	Exports	Imports	Excess
Coal	8,387,020	3,146,729	Exp. 5,240,291
Brown coal	19,492	2,359,341	Imp. 2,339,849
Coke	1,430,536	197,296	Exp. 1,233,240
Briquets	705,525	76,444	Exp. 629,081
Total	10,542,573	5,779,810	Exp. 4,762,763
Total, 1910	8,943,859	5,731,175	Exp. 3,212,684

The exports this year included 4860 tons of coke to the United States.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of coal on June 15, as follows: Best Welsh steam coal, $4.44; seconds, $4.08; thirds, $3.90; dry coals, $3.84; best Monmouthshire, $3.72; seconds, $3.54; best small steam coal, $2.64; seconds, $2.34. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, June 28—The iron and steel markets are more active and business is improving; but we are now at the beginning of what is usually the dull season.

It would require quite unprecedented conditions to effect continued improvement in the iron and steel trade at this particular season of the year, and such conditions do not exist. Prices are well maintained, and while there is little prospect of declines, there are none of advances. Speculative business therefore is not to be expected and as general business conditions in the country have not improved no increase is to be expected in the actual rate of consumption. In these circumstances the widely circulated reports of marked and continued improvement in the iron and steel trade are readily identified as an artificial effort to stimulate a market which has long been lethargic.

In pig iron many inquiries are coming in for fourth-quarter deliveries. Sales are increasing in number; though they are generally of moderate lots, the total is quite large. Prices are about stationary, the business so far not being of a character to warrant advances. A few furnaces have blown in, most of them steel-works stacks; the merchant furnaces have not yet increased, but are beginning to work off their accumulated stocks.

The prices of wire and wire products were reduced late last week by $2 per ton. This brings wire about in line with the recent reductions on other finished-steel products.

Baltimore

June 26—Exports for the week included 2897 tons steel rails and 172 tons railjoints to Rosario, Argentina; 1730 tons rails and 130 tons railjoints to St. Johns, Newfoundland; 1,195,100 lb. steel billets and 142,840 lb. zinc dross to Liverpool. Imports included 12,500 tons iron ore from Cuba.

Birmingham

June 26—While some sales of pig iron have been made in Southern territory for delivery during the third quarter of the year, the aggregate business has not been such as to warrant any attention. The market is still dull and price weak. No. 2 foundry has sold at $10@10.25 per ton, delivery during the third quarter. Some reports have been current that sales were made at these prices for delivery during the last half of the year but there is no verification. So far there has been no change in the production in the Southern territory, though reports have been out for some time that furnaces will close down if there is no change in the demand for iron.

The melt in the home territory shows a little change for the better. The cast-iron pipe plants in operation are all doing well. The increased melt is with the smaller foundries, stove works, etc. The big pipe plant of the Dimmick Pipe and Foundry company may be started up during the early part of the coming month if negotiations on for the acquiring of the plant by the Unitel States Cast Iron Pipe and Foundry Company are consummated.

Chicago

June 27—Although sales are still very light, the demand for pig iron has increased in the last week and bids fair to increase further, to judge from the volume of inquiries. Melters appear to be in need of iron at last, for general last-half delivery, and to have concluded that prices are not likely to go lower. The whole market, indeed, is being closely watched to determine the effects of lessened production and is likely to take a sudden turn that will result in a rush for iron. This possibility is causing the furnace agents to bid less eagerly for business and to hold out against temptations to weaken prices on small lots. It would seem that there cannot be any great demand for needs of the immediate future, in the dullness that exists in business circles generally, many foundries and factories now running only half time. Southern No. 2 brings $10.25@10.50 Birmingham, which means $14.60@14.85 Chicago, and Northern No. 2 holds to $15@15.25. Sales of iron and steel products are light but seem to be improving. Coke is weak at $4.75 for the best Connellsville.

Cleveland

June 26—The iron-ore business continues light, and boats have little to do. Some boats which went up with coal came back light, and several may be laid up.

It is stated that the Bethlehem Steel Company has made a contract, running over several years, for 500,000 tons of 45 per cent. ore, carrying also 3 per cent. manganese. The terms are not made public.

Pig Iron—More inquiries are coming out for foundry and basic iron and the market looks better. Small sales are increasing in number and aggregate tonnage. Quotations, Cleveland delivery, are $15.90 for bessemer, $14.25 for No. 2 foundry, $14.35 for No. 2 Southern, and $13.25 for forge iron.

Finished Material—Bars have been in fair demand. Several new contracts for bridge and building work have been closed. The bar mills generally will close down July 1 for repairs.

Philadelphia

June 28—Some long delayed business in basic pig has finally been closed. Low phosphorus, after a long dullness, became active in small lots with a probable sale of a large lot this week. Small sales of special irons have been made for July delivery. There is fair inquiry for basic, but buyers are looking for further concessions. Eastern furnace interests hope to reduce stocks to the desired minimum during July. Less has been done this week in Southern irons. Makers assert that the last shading of 25c. is assuredly the last. The market is now a waiting one, and evidently wants to see what Southern makers of foundry will do. Additional orders for pipe iron have been placed at a reported concession of 25c. Basic is quoted at $14.50; low phosphorus at $20.50; No. 2 X foundry, Northern, $15@15.50; forge, $14.25@14.50 per ton.

Steel Billets—An improving tone is observable. Forging billets hold up well and good-sized orders are within reach.

Bars—The market is flat and a dragging midsummer season seems certain.

Sheets—A few large buyers have taken advantage of an option to extend their contracts, which means continued activity for some weeks. General buying is better.

Plates—Better business in hand and in sight has imparted some life to the plate industry. Makers are anxiously awaiting action by certain large interests, who have virtually concluded negotiations, but the final word has not been spoken. Boiler and tank orders for small lots are a little above the average.

Structural Material—This week's orders were all for small lots.

Steel Rails—Several fair-sized orders for mine rails have been placed; chiefly for Virginia.

Scrap—Dealers report a general indifference to stocks and the best shadings made have not led to large sales.

Pittsburg

June 27—There has been no further improvement in the iron and steel market since last report, but the improved position then reached is maintained. Production of sheets is slightly heavier than a fortnight or a month ago, while bookings are considerably in excess of production, a fair portion of the bookings being for forward delivery. In other finished steel products bookings are not materially larger than the average of the past few weeks, and the recent improvement which attracted so much attention was chiefly in increased pressure for deliveries upon orders already booked.

The American Steel and Wire Company, the independents promptly concurring, last week made a nominal reduction of 10c. per 100 lb. or $2 per ton in wire products, new prices being: Plain wire, base, 1.50c.; wire nails, base, $1.70; painted barb wire, 1.70c.; galvanized barb wire, 2c.; rods, $27. This restores the level prevailing at the beginning of the year, there having been advances of $1 a ton each on Jan. 23 and March 6. In May contracts at both the old rates were running, although the trade custom is to limit specifications upon contracts to 60 days from date. By understanding among the mills the early contracts were made to run out June 1 and the later contracts July 1, so that the new prices are $1 a ton below contract prices then in force.

Pig Iron—The Standard Sanitary Manufacturing Company has bought 500 tons of Northern No. 2 foundry for early delivery on the same basis it did recently on 2000 tons of foundry and forge, $13.50, Valley. A radiator company at Johnstown has been figuring on 3000 tons of foundry for third quarter but has not closed yet. Odd lots are changing hands, at $13.50@13.75, Valley, according to tonnage and delivery. There is more inquiry, but the market still drags. Bessemer has shown a little activity, the Union Steel Casting Company buying 250 tons and the Pittsburg Valve and Fittings Company 100 tons, both at about $14.85, Valley, the cut price from $15 representing splitting of brokers' commissions. An inquiry is out for 1000 tons and this will determine whether the $15 price which has been held so long can be shaded on a sizable lot. Basic iron is quotable unchanged, there having been no recent transactions, furnaces holding to $13.25, Valley, while reports are in circulation that $12.75 or even less can be done. We repeat former quotations,

f.o.b. Valley furnaces, 90c. higher delivered Pittsburg: Bessemer, $15; basic, $13@13.25; No. 2 foundry, $13.50@13.75; malleable, $13.25@13.50; gray forge, $13@13.25 per ton.

Ferromanganese—The market continues quiet and quotable for prompt and forward at $36.50, Baltimore.

Steel—Specifications on contracts for sheet bars are considerably heavier for June than for May, but billet specifications show no improvement. We continue to quote bessemer and open-hearth at $21 for billets and $22 for sheet bars, f.o.b. maker's mill, Pittsburg or Youngstown. We quote rods at $27, Pittsburg, in accordance with the reduction of $2 a ton made last week.

Sheets—Buying has materially improved and is now fairly active. A considerable part is for forward delivery, and mill operations therefore are only slightly improved, averaging between 60 and 70 per cent. of the full capacity. The independent sheet and tin mills which operate under union auspices closed with the Amalgamated Association last Friday on the scale for the year beginning July 1, existing rates being continued, with a few minor changes in foot notes. Of the 371 sheet and tin mills in the independent plants 69 tin and 80 sheet are union, while all the American Sheet and Tin Plate Company's 235 tin and 204 sheet mills are non-union.

Puddling Rates—The Republic Iron and Steel Company today signed the mill-wage scale with the Amalgamated Association, being the existing scale with one small concession. This will force the Western Bar Iron Association to do the same, though it had asked for 10 per cent. reduction.

St. Louis

June 26—The pig-iron market is a little duller. Several of the largest foundries are shut down and others are running light. The expectation of buyers that the bottom had not been reached was verified during the last ten days when a quotation of $10.25 per ton, Birmingham, was sent out and a few sales were reported as low as $10. The current market seems to be $10.25, Birmingham, or $14 St. Louis for No. 2 foundry.

Iron Ore Markets

On application of the Ontario Iron Ore Company, the Interstate Commerce Commission has ordered the rate on iron ore from Lakeside, N. Y., to the furnace at Earlston, Penn., reduced from $1.90 to $1.60 per ton. In the complaint it was stated that this ore sold at $3.50 per ton at furnace.

It is stated that the Bethlehem Steel Company has contracted for a large tonnage of Swedish iron ore, at a price which works out about 7½c. per unit. The ore is high grade, 60 to 65 per cent. iron.

Sault Ste. Marie Canal Traffic

The total tonnage passing through the Sault Ste. Marie canals for the season to June 1 was, in short tons:

	1910	1911	Changes
East-bound.....	8,095,083	4,531,433	D. 3,563,650
West-bound.....	2,392,116	2,386,172	D. 5,944
Total.....	10,487,199	6,917,605	D. 3,569,594

The total number of vessel passages this year was 2641, showing an average cargo of 2619 tons. The mineral freights included in the totals were, in short tons, except salt, which is stated in barrels:

	1910	1911	Changes
Coal.....	2,046,266	2,059,146	I. 12,880
Iron ore.....	6,992,650	3,889,120	D. 3,103,530
Pig and mfd. iron.	94,703	84,605	D. 10,098
Copper.....	22,202	21,405	D. 797
Building stone.....	.....	612	I. 612
Salt, bbl.....	159,143	175,815	I. 16,672

Iron ore was 56.2 per cent. of the total freight this year; coal, 29.8 per cent.

FOREIGN IRON TRADE

British Foreign Trade—Imports and exports of iron and steel, and of machinery, in Great Britain five months ended May 31 are valued by the Board of Trade returns as follows:

	Exports	Imports	Excess
Iron and steel	£18,560,339	£4,815,834	Ex. £13,744,505
Machinery...	12,959,254	2,644,034	Ex. 10,315,220
Cutlery and hardware..	3,057,566	2,107,691	Ex. 949,875
New ships....	2,034,464	.....	Ex. 2,034,464
Total.....	£36,611,623	£ 9,567,559	Ex. £27,044,064
Total, 1910..	35,596,987	7,155,452	Ex. 28,441,535

Increase in exports, £1,014,636, or 2.9 per cent.; increase in imports, £2,412,-107, or 33.7 per cent. The actual quantities of iron and steel were, in long tons:

	1910	1911	Changes
Exports.....	1,914,143	1,882,856	D. 31,287
Imports.....	544,481	766,057	I. 221,576

The increase in imports was largely in blooms, billets, tinplate bars and other half-finished material.

Britsh Iron Ore Trade—Imports of iron ore into Great Britain, five months ended May 31, were 3,109,788 long tons in 1910, and 3,021,361 in 1911; decrease, 88,427 tons.

METAL MARKETS

New York, June 28—The metal markets show a fair degree of activity, with prices steady. The corner in tin is apparently over for the present.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold:			
May 1911..	$6,817,149	$ 5,014,740	Exp. $ 1,802,409
" 1910..	718,678	3,143,338	Imp. 2,424,660
Year 1911..	10,176,807	29,004,012	Imp. 18,827,205
" 1910..	47,918,384	14,812,614	Exp. 33,105,770
Silver:			
May 1911..	5,054,304	3,555,543	Exp. 1,498,761
" 1910..	4,130,754	3,354,715	" 776,039
Year 1911..	28,665,500	18,451,559	" 10,213,941
" 1910..	22,466,835	18,593,349	" 3,873,486

Exports from the port of New York, week ended June 24: Gold, $100; silver, $1,231,-801, chiefly to London. Imports: Gold, $1,101,604, principally from Mexico; silver, $93,617, from Mexico and South America.

Gold—Prices on the open market in London were unchanged, at 77s. 9d. per oz. for bars, and 77s. 4½d. per oz. for American coin. Nearly all the supplies arriving this week were taken for German account.

Platinum—The market is steady and no change in prices is reported. Dealers ask $42.50@43 per oz. for refined platinum and $45@45.50 per oz. for hard metal, 10 per cent. iridium.

Iridium—Prices are steady, $62 per oz. being asked for pure metal.

Silver—The market has been dull and quiet for the past week, owing to London holidays; closing steady today at 24⅜d., without special feature.

SILVER AND STERLING EXCHANGE

June	22	23	24	26	27	28
New York....	52⅞	52⅞	52¾	52¾	52⅞	52¾
London....	....	....	24⅜	24⅜	24 7/16	24⅜
Sterling Ex.	4.8590	4.8590	4.8585	4.8590	4.8605	4.8605

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to June 15, as reported by Messrs. Pixley & Abell:

	1910	1911	Changes
India.....	£2,749,500	£4,008,700	I. £1,259,200
China.....	1,113,500	822,800	D. 290,700
Total.....	£3,863,000	£4,831,500	I. £ 968,500

India Council bills in London brought an average of 16d. per rupee for the week.

Copper, Tin, Lead and Zinc

NEW YORK

June	Copper: Lake, Cst. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
1	12⅝	12 50		4.47½	4.32½	5.65	5.50
22	@12⅞	@12.60	42½	4.50	@4.37½	@5.70	@5.55
23	12⅝ @12⅞	12.50 @12.60	42⅝	4.47½ 4.50	4.32½ @4.37½	5.70 @5.75	5.55 @5.60
24	12⅝ @12⅞	12.50 @12.60	42¾	4.47½ 4.50	4.32½ @4.37½	5.70 @5.75	5.55 @5.60
26	12⅝ @12⅞	12.50 @12.60	43¼	4.47½ 4.50	4.32½ @4.37½	5.70 @5.75	5 55 @5.60
27	12⅝ @12⅞	12.50 @12.60	43⅜	4.47½ 4.50	4 32½ @4.37½	5 70 @5.75	5.55 @5.60
28	12⅝ @12⅞	12 50 @12 60	42¾	4.47½ 4.50	4.32½ @4 37½	5.70 @5.75	5 55 @5.60

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—While the advance in the market as reported last week has been

LONDON

June	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
22	....	....	.....	.....	.....	....	....
23	....	....	.....	.....	.....	....	....
24	....	....	.....	.....	.....	....	....
26	57½	58 1/16	61½	196	192½	13⅝	24⅝
27	57 1/16	57⅞	61½	197½	191¾	13⅝	24⅝
28	56⅞	57 1/16	61	194½	189½	13 11/16	24¾

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £12 = 2.61c.; £23 = 5c.; £60 = 13.04c. ± £1 = ± 0.21¾c.

well maintained, business has quieted down materially, which, however, is not surprising in view of the very heavy transactions during the last few weeks which have left buyers and sellers alike in a comfortable position. The market closes steady and unchanged at 12⅝@12⅞c. for Lake copper, and 12.50@12.60c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 12¼@12½ cents.

Copper sheets are 18@19c. base, for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 13¾c. base, carload lots at mill. Business is reported good.

The London standard market, which had a short-lived spurt upward, has also quieted down, and closes steady at £56 17s. 6d. for spot copper, and £57 8s. 9d. for three months.

Exports of copper from New York for the week were 5871 long tons. Our special correspondent gives the exports from Baltimore for the week at 296 tons.

Tin—The London market which, on account of the Coronation holidays, was closed during the second half of last week, opened very firm on Monday, but quotations, although transactions were but small, advanced considerably and reached their high point on June 27. Subsequently, however, the market became weaker and the close is cabled at £194 10s. for spot, and £189 10s. for futures.

Interest in this market is almost entirely lacking, and rarely have inquiries from consumers been as small as they are at present. The only interest shown is in cases where some spot tin is required, which, however, is scarce, and held at a considerable premium. The shipments from abroad will be comparatively small, so far as the near future is concerned, and if demand should revive with the beginning of July, a considerable shortage of spot material may ensue. Spot tin is held at about 45c., while July can be bought at about 42¾ cents.

A contract for tin for the Mare Island navy yard, California, has been taken at 41.95c. per lb., by L. Vogelstein & Co., New York.

Exports of tin from the Straits, four months ended April 30: United States, 5524; Great Britain, 8455; other Europe, 2245; China, 137; India, 498; total, 16,859 long tons, a decrease of 832 tons from last year.

Lead—A good business has been doing from day to day at 4.32½@4.37½c., St. Louis, and 4.47½@4.50c., New York. The advance in Europe has made further progress under the stimulus of a large business, the closing being firm at £13 8s. 9d. for Spanish and £13 11s. 3d. for English lead.

Spelter—The market has been strong throughout the week, although the volume of business has been relatively small. The stocks in the hands of smelters are believed to have been reduced to a minimum. The market closes steady at 5.55@5.60c., St. Louis, and 5.70@5.75c., New York. The reports about the European market are as strong as at any time, and foreshadow a further advance.

Zinc dust is quoted at 6⅞c. per lb., New York.

The London Metal Exchange quotations are cabled at £24 15s. for good ordinaries and £25 for specials.

Base price of zinc sheets has been advanced ¼c. per lb., and is now $7.50 per 100 lb., f.o.b. La Salle-Peru, less 8 per cent. discount.

Other Metals

Aluminum—The market is quiet and prices remain unchanged at 19¾@20¼c. per lb. for No. 1 ingots.

Antimony—Business is dull, with sales only of a retail order. Cookson's is held at 8.50c. per lb. and Hallett's at 8c.; while 7.30@7.50c. is asked for Chinese, Hungarian and other outside brands.

Quicksilver—Spot supplies are again rather scarce, but prices are unchanged. New York quotation is $44, to arrive, per flask of 75 lb. San Francisco, $43.50@44 for domestic orders and $41@41.50 for export. London quotations are £8 7s. 6d. per flask, with £7 17s. 6d. named from second hands.

The report of the Quicksilver Mining Company, California, for the year ended April 30 last, says: "Your company has been diligently seeking new orebodies during the year with some success. In addition it has been working upon a new enterprise foreign to anything attempted since the incorporation, some 50 years ago. This consists of utilizing some of the waste slag, which has been thrown away, and creating a market for this manufactured byproduct."

Bismuth—The current price of bismuth in London is 7s. 6d.—or $1.80—per pound.

Cadmium—This metal is quoted at works in Germany at 725@750 marks per 100 kg.—equal to 78.3@81c. per lb.—according to size of order.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Nickel—Large lots, contract business, 40@50c. per lb. Retail spot, from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, five months ended May 31, figures in long tons, except quicksilver, which is in pounds:

Metals:	Imports	Exports	Excess	
Copper, long tons	63,250	33,893	Imp.	29,357
Copper, 1910....	55,300	31,263	Imp.	21,037
Tin, long tons....	17,360	18,537	Exp.	1,177
Tin, 1910.....	16,351	17,169	Exp.	818
Lead, long tons..	86,467	18,687	Imp.	67,780
Lead, 1910.....	87,663	21,252	Imp.	66,411
Spelter, l'g tons..	54,508	4,272	Imp.	50,236
Spelter, 1910....	51,628	3,774	Imp.	47,854
Quicksilver, lb...	2,210,799	1,262,733	Imp.	948,066
Quicksilver, '10	2,641,390	452,436	Imp.	2,189,954
Minor met's, tons	2,323	8,717	Exp.	6,394
Minor, 1910.....	2,152	10,761	Exp.	8,609
Ores:				
Tin ore and con.	12,050	.....	Imp.	12,050
Tin ore, 1910...	11,182	.....	Imp.	11,182
Pyrites	395,274	.....	Imp.	395,274
Pyrites, 1910...	333,059	.....	Imp.	333,059

Copper totals include metallic contents of ore and matte. Exports include reexports of foreign material. Miscellaneous metals include nickel, aluminum and the minor metals and alloys. Of the imports in 1911, the United States furnished in all 21,872 tons fine copper, and 16,159 tons lead. This lead was chiefly Mexican, refined in this country.

Zinc and Lead Ore Markets

Platteville, Wis., June 24—The base price paid this week for 60 per cent. zinc ore was $41@42. The base price paid for 80 per cent. lead ore was $54 per ton.

SHIPMENTS, WEEK ENDED JUNE 24

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville.....	643,760	.....	231,700
Mineral Point.....	602,280	.....	.....
Galena.....	520,400	.....	.....
Hazel Green.....	412,120	57,700	.....
Harker.....	406,420	.....	.....
Highland.....	251,300	.....	.....
Shullsburg.....	173,400	.....	.....
Benton.....	143,400	65,000	.....
Rewey.....	129,000	.....	.....
Linden.....	117,160	.....	.....
Cuba City.....	84,320	54,820	157,800
Montfort.....	84,000	.....	.....
Total.....	3,567,560	177,520	389,500
Year to date.....	70,609,199	4,164,845	16,757,160

Shipped during week to separating plants, 2,411,360 lb. zinc ore.

Joplin, Mo., June 24—The highest price paid for zinc sulphide ore was $45, the base ranging from $40 to $43 per ton of 60 per cent. zinc. Silicate sold at $20@22 per ton of 40 per cent. zinc. The

average price, all grades of zinc, was $38.40 per ton. The highest price paid for lead ore was $58 and the average price, all grades of lead, was $56.74 per ton.

The upward trend of the spelter market is bringing immediate returns to the producers of zinc ore in this district. It can be almost truthfully said that the high base price of last week is the low base price of this week. Several bins of the choicest blende sold for $43 per ton of 60 per cent. zinc, numerous sales were made on a $42.50 base offering, with the bulk of all other sulphide ore selling at $41.50 to $42 per ton of 60 per cent. zinc. Reports of purchases at $39 and even $40 per ton base have been traced to offerings of last week that were accepted before this week's market was made.

While there is probably an excess of 9000 tons of ore in bins throughout the district, at least half this is sold; while over 2000 tons of the unsold ore is wholly withdrawn from the market by price limitation, leaving a net workable stock of merely 2500 tons, and this is largely the leavings at the week-end when carload shipments are made out. Locally, therefore, the zinc ore market is in the healthiest position it has occupied this year.

SHIPMENTS, WEEK ENDED JUNE 24

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4 232,140	.....	911,060	$112,722
Joplin	2,294,120	.....	395,490	59,531
Alba-Neck	805,960	.....	19,380	17,366
Galena	598,720	.....	135,580	16,137
Oronogo	452,970	.....	141,170	12,377
Granby	536,330	174,770	8,050	12,189
Miami	592,880	.....	150,810	10,934
Spring City	133,820	613,560	58,300	10,779
Duenweg	339,350	.....	.....	6,956
Aurora	126,940	190,210	.....	4,631
Jackson	126,900	.....	.....	2,538
Badger	84,930	.....	8,320	2,020
Carl Junction	79,530	.....	.....	1,790
Carthage	85,600	.....	.....	1,712
Cave Springs	64,350	.....	.....	1,351
Quapaw	49,640	.....	.....	943
Totals	10,585,180	978,540	1,828,160	$273,976
25 weeks	246,566,130	16,483,070	42,403,590	$6,205,498

Blende val., the week, $211,602; 25 weeks, $4,833,394
Calamine, the week, 10,494; 25 weeks, 192,035
Lead value, the week, 51,880; 25 weeks, 1,180,069

MONTHLY AVERAGE PRICES

Month	Zinc Ore: Base Price		Zinc Ore: All Ores		Lead Ore: All Ores	
	1910	1911	1910	1911	1910	1911
January	$47.31	$41.85	$45.16	$40 55	$56.99	$55.68
February	40.69	40.21	39.47	39.16	55.64	54.46
March	43.60	39.85	39.71	38.45	51.26	54.77
April	41.00	38.88	39.33	37.47	49.72	56.37
May	40.19	38.25	37.51	36.79	48.16	55.21
June	40.20	.....	37.83	.....	48.80	.....
July	39.63	.....	36.80	.....	48.59	.....
August	40.13	.....	37.32	.....	49.75	.....
September	43.45	.....	39.96	.....	54.73	.....
October	43.31	.....	40.50	.....	53.18	.....
November	47.20	.....	43.20	.....	54.80	.....
December	42.50	.....	40.70	.....	55.70	.....
Year	$42.43	.....	$39.79	.....	$52.12	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, June 28—The general market is quiet but steady, with no special feature.

Copper Sulphate—Demand is good and supplies are not plentiful. Prices continue firm at $4.50 per 100 lb. for carload lots and $4.75 per 100 lb. for smaller parcels.

Arsenic—A strong and rather unexpected demand from the makers of insecticides has swept the market bare of supplies. Prices have advanced sharply, $2 per 100 lb. being asked for white arsenic for early delivery, and $1.75 per 100 lb. for futures.

Nitrate of Soda—Business in this article is good, and prices are firm. Spot nitrate is quoted at 2.12½c. per lb., while 2.15c. is named for future positions.

Sulphur—Messrs. Parsons & Petit, New York, report the importation by them of 200 tons crude brimestone from Sicily.

MINING STOCKS

New York, June 28—Early in the week the market showed some activity. Trading was on a larger scale and there were advances in a number of stocks. Later, however, matters lapsed into quietness again, and business decreased, changes in quotations being only fractional. The close is dull and inclined to be weak.

There was one sale of Homestake, 100 shares changing hands at $84.50 per share.

The Curb market was also active for a time, with prices strong. The copper shares were called for, and found a good market. Later, however, dullness sent in and trading became rather narrow. Braden was the only copper stock that held its own. Cobalt and Porcupine shares received some attention, but showed no considerable advances.

Boston, June 27—Mining shares have pursued a more or less irregular course the past week, although at that the undertone has been good. Prices have followed the trend of the Wall Street list to an extent, particularly that of Amalgamated. In special stocks there have been substantial advances, but in the majority of cases, prices are slightly lower than a week ago.

Calumet & Hecla subsidiary stocks continue in the dumps, while Calumet itself is seldom quoted. Refusal to grant the injunction brought by G. A. Hyams to consolidate with the Osceola had little or no effect on these stocks. East Butte and Hancock were both conspicuous, the former advancing to $14.75 on knowledge that the cost sheets are showing lower and lower all the time. Hancock rose $1.50 to $30.25 on good rock results at depth.

North Butte, after advancing to $35, reacted to $33.62½ on speculative selling. American Zinc lacked support and slipped off $1.25 ex-dividend. Old Colony mining sold up to $2.25, this being assessment paid.

COPPER PRODUCTION REPORTS
Copper contents of blister copper, in pounds

Company	March	April	May
Anaconda	21,900,000	21,500,000	22,100,000
Arizona, Ltd.	3,094,000	2,840,000	2,800,000
Balaklala	866,670	880,921	978,426
Copper Queen	7,333,629	6,933,422	7,140,196
Calumet & Ariz.	1,960,000	3,850,000	3,854,000
Detroit	1,914,710	1,814,740	1,709,530
East Butte	1,120,000	1,085,000	.....
Imperial	.....	.....	.....
Nevada Con.	5,632,259	5,298,632	.....
Old Dominion	2,563,000	2,535,000	2,363,000
Shannon	1,322,000	1,258,000	.....
South Utah	300,007	300,137	318,350
Superior & Pitts.†	2,540,000	.....	.....
United Verde*	3,000,000	2,500,000	3,000,000
Utah Copper Co.	7,260,267	8,169,248	8,391,879
Lake Superior*	20,000,000	16,000,000	19,000,000
Non-rep. mines*	12,224,993	11,825,000	13,280,000
Total production	93,031,535	86,790,100	.....
Imports, bars, etc.	24,345,814	25,655,122	.....
Total blister	117,377,349	112,445,222	.....
Imp. in ore & matte	6,126,650	5,207,484	.....
Total	123,503,999	117,652,706	.....
Brit. Col. Cos.:			
British Col. Copper	804,542	952,284	.....
Granby	1,988,341	1,825,340	.....
Mexican Cos.:			
Boleo	2,700,880	2,403,520	2,411,500
Cananea	3,542,000	3,644,000	4,098,000
Moctezuma	2,049,150	2,315,292	2,403,583
Exports from:			
Chile	7,168,000	5,152,000	7,392,000
Australia	9,632,000	5,936,000	11,088,000

Figures are reports received from companies, unless otherwise stated. Boleo copper does not come to American refiners.
*Estimated.
†From April the Superior & Pittsburg production is included with Calumet & Arizona.

STATISTICS OF COPPER

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries, for Export
V, 1910	123,242,476	59,305,222	45,495,400
VI	127,219,188	53,363,196	65,895,948
VII	118,370,003	56,708,175	59,407,167
VIII	127,803,618	67,731,271	61,831,780
IX	119,519,983	64,501,018	75,106,496
X	126,469,284	67,814,172	68,186,912
XI	119,353,463	60,801,992	67,424,316
XII	123,339,219	43,594,018	88,104,075
Year 1910	1,452,122,120	749,426,542	722,431,494
I, 1911	115,696,591	42,078,567	53,208,739
II	109,828,297	50,518,998	45,111,019
III	130,532,080	66,080,789	59,081,127
IV	118,085,223	52,407,650	62,129,599
V	126,962,544	64,543,963	61,978,557

	Visible Stocks. United States.	Europe.	Total.
VI, 1910	160,425,973	239,142,400	399,568,378
VII	168,386,017	232,892,800	401,278,817
VIII	170,640,678	222,320,000	392,960,675
IX	168,881,245	218,444,800	387,326,046
X	148,793,714	211,276,800	360,070,519
XI	139,261,914	198,060,800	337,322,711
XII	130,389,069	193,200,000	323,589,095
I, 1911	122,030,195	236,629,120	358,649,373
II	142,439,490	236,992,000	379,431,134
III	156,637,770	233,385,600	390,023,009
IV	162,007,934	223,014,400	385,022,434
V	165,555,908	212,284,800	377,840,708
VI	165,995,932	202,540,800	368,536,732

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month. From Jan. 1, 1911, stocks at Hamburg and Rotterdam are included in the visible stocks for Europe.

Curb trading has been fairly active. Begole Syndicate rose $2.37½ to $5, and Boston Ely rose 75c. to $2.37½. First National was but little affected by the order of the California Court that operations at the Balaklala smelting plant must cease.

Assessments

Company	Delinq	Sale	Amt
Caledonia, Nev	June 2	June 21	$0.10
Clear Grit, Ida	June 9	July 6	0.002½
Con. Virginia, Nev.	June 14	July 5	0.25
Dennemora, Ida	June 26	July 26	0.002
East Hercules Extens'n, Id.	June 19	July 19	0.001
Julia Con., Nev	June 29	July 27	0.05
Laclede, Ida	July 8	July 31	0.003
Mass, Mich	June 15		2.00
Missoula Copper, Ida	June 5	July 19	0.01
New York-Bonanza, Utah	June 8	June 29	0.02
Nine Mile, Ida	June 25	July 30	0.001
Old Colony, Mich	June 26		1.00
Oreano, Ida	Aug. 1	Sept. 1	0.003
Reindeer, Ida	June 1	July 1	0.005
Rockford, Ida	June 6	July 6	0.001
Sierra Nevada, Nev	July 21	Aug. 11	0.10
Silver Mountain, Ida	June 20	July 20	0.003
Smuggler, Utah	May 20	June 20	0.005
Snowstorm Extension, Ida.	June 22	July 24	0.003
Temple, Ida	June 27	July 26	0.002
Trans.-Continental, Ida	June 30	July 22	0.002
Tyler, Ida	July 7	Aug. 8	0.001
Union Con., Nev	July 12	Aug. 4	0.15
Utah Mining, Nev	July 10	July 31	0.05
Utah United Copper, Utah	June 24		0.01
Wonderful, Ida	May 22	July 10	0.001

Monthly Average Prices of Metals

SILVER

Month.	New York.			London.		
	1909.	1910.	1911.	1909.	1910.	1911.
January	51.750	52.375	53.795	23.843	24.154	24.865
February	51.472	51.534	52.222	23.706	23.794	24.081
March	50.468	51.454	52.745	23.227	23.690	24.324
April	51.428	53.221	53.325	23.708	24.483	24.595
May	52.905	53.870	53.308	24.343	24.797	24.583
June	52.538	53.462		24.166	24.651	
July	51.043	54.150		23.519	25.034	
August	51.125	52.912		23.588	24.428	
September	51.440	53.295		23.743	24.567	
October	50.923	55.490		23.502	25.596	
November	50.703	55.635		23.351	25.680	
December	52.226	54.428		24.030	25.160	
Total	51.502	53.486		23.706	24.670	

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

Month.	New York. Electrolytic		New York. Lake.		London, Standard.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	13.620	12.295	13.870	12.680	60.923	55.604
February	13.332	12.256	13.719	12.611	59.388	54.970
March	13.255	12.139	13.586	12.447	59.214	54.704
April	12.733	12.019	13.091	12.275	57.238	54.035
May	12.550	11.989	12.885	12.214	56.313	54.313
June	12.404		12.798		55.310	
July	12.215		12.570		54.194	
August	12.490		12.715		55.733	
September	12.379		12 668		55.207	
October	12.553		12.788		56.722	
November	12.742		12.914		57.634	
December	12.581		12.863		56.769	
Year	12.738		13.039		57.054	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

TIN AT NEW YORK

Month.	1910.	1911.	Month.	1910.	1911.
January	32.700	41.255	July	32.695	
February	32.920	41.614	August	33.972	
March	32.403	40.157	September	34.982	
April	32.976	42.185	October	36.190	
May	33.125	43.115	November	36.547	
June	32.769		December	38.199	
			Av. Year	34.123	

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1910.	1911	1910.	1911.	1910.	1911.
January	4.700	4.483	4.582	4.334	13.650	13.009
February	4.613	4.440	4.445	4.266	13.328	13.043
March	4.459	4.394	4.307	4.238	13.063	13.122
April	4.376	4.412	4.225	4.262	12.6s1	12.889
May	4.315	4.373	4.164	4.223	12.550	12.984
June	4.343		4.207		12.688	
July	4.404		4.291		12.531	
August	4.400		4.290		12.513	
September	4.400		4.289		12.582	
October	4.400		4.271		13.091	
November	4.442		4.314		13.217	
December	4.500		4.363		13.197	
Year	4.446		4.312		12.920	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	6.101	5.452	5.951	5.302	23.350	23.887
February	5.569	5.518	5.419	5.368	23.188	23.276
March	5.637	5.563	5.487	5.413	23.031	23.016
April	5.439	5 399	5.289	5.249	22.469	23.743
May	5.191	5.348	5.041	5.198	22.100	24.375
June	5.128		4.978		22.094	
July	5.152		5.002		22.406	
August	5.279		5.129		22.800	
September	5.514		5.364		23.165	
October	5.628		5.478		23.900	
November	5.976		5.826		24.083	
December	5.624		5.474		24.019	
Year	5.520		5.370		23.050	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG.

	Bessemer		Basic		No. 2 Foundry	
	1910	1911	1910	1911	1910	1911
January	$19.90	$15.90	$17.98	$14.40	$17.94	$14.75
February	18.96	15.90	17.21	14.50	17.38	14.81
March	18.53	15.90	16.93	14.65	17.00	14.96
April	18.28	15.90	16.84	14.65	16.75	15.00
May	17.10	15.90	15.94	14.30	16.18	14.72
June	16.52		15.60		15.53	
July	16.40		15.40		15.40	
August	16.09		14.89		15.16	
September	15.92		14.73		14.93	
October	15.90		14.05		14.88	
November	15.84		14.26		14.78	
December	15.90		14.15		14.65	
Year	$17.10		$15.65		$15.83	

STOCK QUOTATIONS

COLO. SPRINGS June 27

Name of Comp.	Bid.
Acacia	.03½
Cripple Cr'k Con.	.01⅜
C. K. & N.	.10
Doctor Jack Pot	.05½
Elkton Con	.58
El Paso	.53
Findlay	.04
Gold Dollar	.10½
Gold Sovereign	.02
Isabella	.09⅜
Jack Pot	.04½
Jennie Sample	.09
Lexington	‡.01
Moon Anchor	.02½
Old Gold	.03
Mary McKinney	.33
Pharmacist	‡.01½
Portland	.99
Vindicator	.78
Work	‡.02

SALT LAKE June 27

Name of Comp.	Bid.
Beck Tunnel	.31½
Black Jack	.15
Carisa	.15
Cedar Talisman	.05
Colorado Mining	.48½
Columbus Con	‡.44
Daly Judge	‡4.30
Grand Central	.77
Iron Blossom	1.37½
Little Bell	.46
Lower Mammoth	.11
Mason Valley	9.00
May Day	.13½
Nevada Hills	3.07½
New York	‡.13½
Prince Con	.76
Silver King Coal'n	1.50
Sioux Con	.30
Uncle Sam	.61
Yankee	‡.20

TORONTO June 27

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	6.90	Pearl Lake	.64
Hudson Bay	.80	Porcu. Gold	.63½
Temiskaming	.54	Porcu. Tisdale	.10½
Wettlaufer-Lor	1.21	Preston E. D	.45
Apex	.17½	West Dome	2.40
Central	.85	Standard	.09
Dobie	2.90	Canada	1.10
Dome Exten	.84	Rea	5.85
Hollinger	15.10	Coronation	.39
Imperial	.15	Swastika	.66

SAN FRANCISCO June 27

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	6.07½
Belcher	.50	Jim Butler	.26
Best & Belcher	.34	MacNamara	.17
Caledonia	.45	Midway	.18
Challenge Con	.14	Mont.-Tonopah	.70
Chollar	.09	North Star	.14
Confidence	.60	West End Con	.49
Con. Virginia	1.15	Atlanta	.12
Crown Point	.40	Booth	.07
Gould & Curry	.19	C.O.D. Con	.07
Hale & Norcross	.19	Comb. Frac	.08
Mexican	3.95	Jumbo Extension	.29
Occidental	.65	Oro	.05
Ophir	1.92½	Silver Pick	.05
Overman	.41	St. Ives	.10
Potosi	.24	Tramps Con	‡.02
Savage	.18	Argonaut	1.75
Sierra Nevada	.42	Bunker Hill	7.00
Union Con	1.52½	Cent. Eureka	1.00
Yellow Jacket	.31	So. Eureka	‡7.00

N. Y. EXCH. June 27

Name of Comp.	Clg.
Amalgamated	70
Am. Agri. Chem	56⅛
Am.Sm.&Ref.,com	79¼
Am. Sm.& Ref., pf.	106½
Anaconda	40⅛
Batopilas Min	1⅞
BethlehemSteelpf	62⅝
Chino	23¾
Comstock Tunnel	‡.29
Federal M.& S., pf.	65⅜
Goldfield Con	6
Great Nor., ore ctf.	61¾
Homestake	84
Miami Copper	22½
Nat'nalLead,com.	56
National Lead, pf.	107¾
Nev. Consol	19⅞
Pittsburg Coal, pf.	85
Ray Con	17¾
RepublicI&S,com	30¾
Republic I & S, pf.	93¼
SlossSheffi'd,com.	51
Sloss Sheffield, pf.	‡112
Tennessee Copper	41¾
Utah Copper	50
U. S. Steel, com	79¼
U. S. Steel, pf	118⅛
Va. Car. Chem	56¼

N. Y. CURB June 27

Name of Comp.	Clg.
Barnes King	‡.15
Braden Copper	4⅞
B. C. Copper	5⅛
Buffalo Mines	1.70
Butte & Vipond	.55
Butte Coalition	19⅛
Calumet & Mont.	‡.20
Cobalt Central	.03
Con. Ariz Sm	1⅜
Davis-Daly	‡1¼
Ely Con	‡1½
Florence	1½
Giroux	6¾
Greene Cananea	7⅞
Greenwater	‡.07
Guanajuato	‡3¼
Guerrero	‡1⅛
Guggen. Exp	‡205
Inspiration	9
Internat. S. & R.	‡124
Kerr Lake	5
La Rose	4⅝
McKinley-Dar-Sa.	1¾
Min. Co. of A. new	5¾
Moneta Porc	.22¼
Mont. Shoshone	‡.04
Nev. Utah M. & S.	¾
New Baltic	6
Nipissing Mines	10¾
Ohio Copper	1⅛
Pacific Sm. & M.	¾
Precious Metals	‡½
Ray Central	1⅛
Red Warrior	‡1½
South Utah M.& S.	⅞
Standard Oil	649
Stewart	.98
Tonopah	6⅛
Tonopah Ex	.95
Tri-Bullion	‡½
Tularosa	⅞
Union Mines	‡.17
Yukon Gold	4½

LONDON June 28

Name of Com.	Clg.
Camp Bird	£1 11s 3d
Dolores	1 10 0
El Oro	1 5 3
Esperanza	1 10 7½
Mexico Mines	8 1 3
Oroville	0 6 9
Stratton'sInd.	0 2 3
Tomboy	0 18 1½

BOSTON EXCH. June 27

Name of Comp.	Clg.
Adventure	6¼
Algomah	10
Allouez	31
Am. Zinc	28¼
Arcadian	3½
Arizona Com	16½
Atlantic	6⅛
Bonanza	.50
Boston & Corbin	14
Butte & Balak	4¾
Calumet & Ariz	60½
Calumet & Hecla	470
Centennial	12
Con. Mercur	.07
Copper Range	61
Daly-West	6
East Butte	14¼
Franklin	12¾
Granby	42
Hancock	28⅛
Hedley Gold	‡14½
Helvetia	1¼
Indiana	15
Isle Royale	18
Keweenaw	3
Lake	37½
La Salle	3½
Mass	9
Michigan	2
Mohawk	50½
New Arcadian	3½
North Butte	33½
North Lake	8
Ojibway	7¼
Old Dominion	48½
Osceola	103
Parrot	12¾
Quincy	74
Shannon	11½
Shattuck-Ariz	‡18¾
Superior	32½
Superior & Bost	7¼
Superior & Pitts	17½
Tamarack	35
Trinity	4¼
U. S. Smelting	39⅝
U. S. Smelt'g, pf.	49¼
Utah Apex	3¼
Utah Con	18
Victoria	1¾
Winona	8½
Wolverine	113
Wyandot	1⅜

BOSTON CURB June 27

Name of Comp.	Last
Ahmeek	165
Bingham Mines	‡1½
Boston Ely	2¼
Boswyocolo	.08
Cactus	.12
Calaveras	1⅞
United Verde Ext.	.89
Chief Cons	1
Corbin	4
Cortez	1½
Crown Reserve	3⅜
First Nat. Cop	1½
Live Oak	20½
Majestic	.76
Mazatan	1½
Nat'l Mine & Ex.	.19
Nevada-Douglas	2¾
Oneco	2
Raven Copper	29
Rhode Island Coal	2
San Antonio	‡1.03
South Lake	8¾
Trethewey	85
Tuolumne Copper	4¾
United Zinc, pfd.	‡2
Vulture	6
Yuma	‡.02

‡Last quotation.